

### Part 1: Getting Started, Hobby Knives, and Parts Prep

In *Modeler's Resource*® #45, two "Letters" column submissions stated the writers' desire to learn more about the basic supplies used in plastic modeling, and the techniques for employing them. At the time this issue appeared, I met a fellow MR reader at an IPMS model contest. We got to talking and he reiterated the concerns of those Letters column contributors.

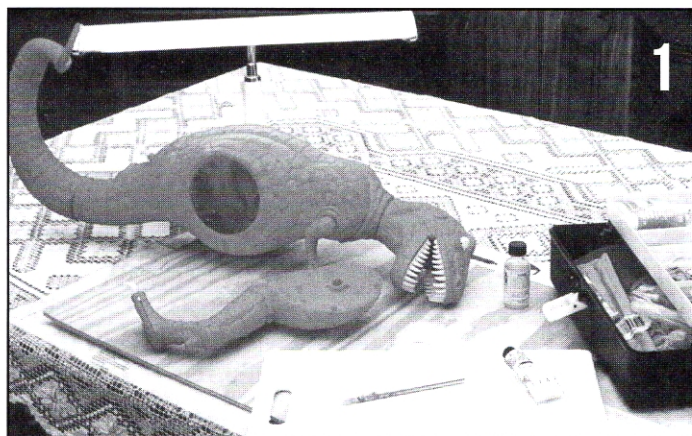
This made me think there might be many other MR readers who were either newcomers to the hobby, or had come back to it after a long absence. These modelers might find use for a general description of the basic tools, materials and techniques used to build plastic models. I suggested such a guide to Fred DeRuvo and this series is the result.

We'll go through all the steps of building a single styrene model kit, from start to finish. Along the way, common modeling terms will appear in bold type. To Bill Nardone and Michael Cook, who wrote to the "Letters" column, and Bob from Plymouth, Michigan, with whom I spoke at Century-Con 2002 I say: thanks for the idea, guys.

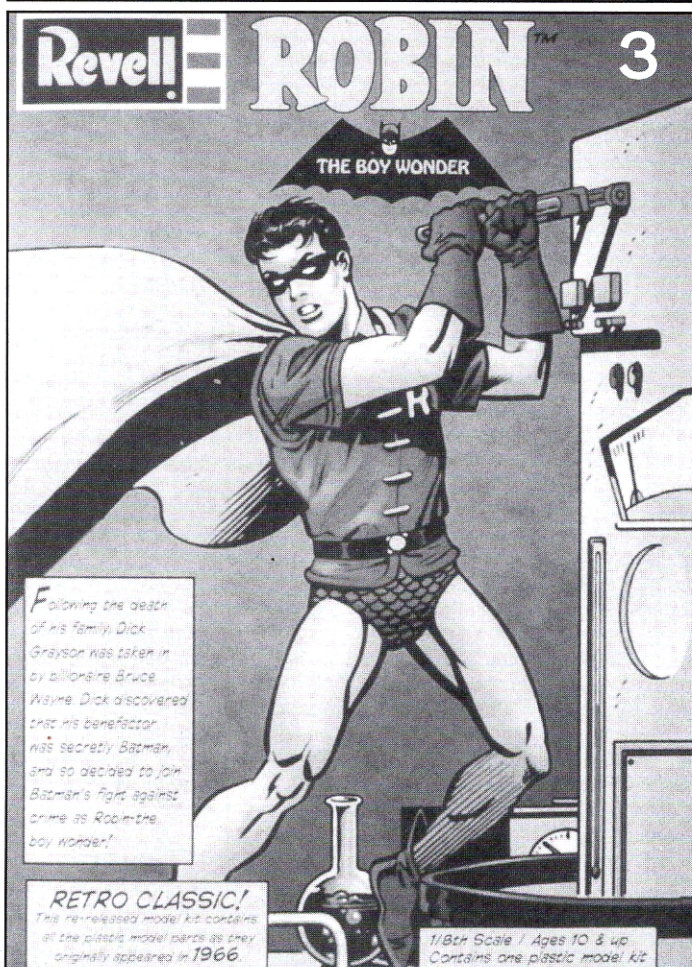
The very first requirement for building plastic models is a place in which to build them. If you have a basement or other dedicated workroom then the problem is solved. A workbench of some sort will be your next priority. This doesn't have to be a bench, necessarily - any sort of sturdy table will do.

If you don't have a dedicated workspace, you'll need to adapt. A portable work surface is the easiest solution. This could be a piece of plywood or something similar. If the kitchen or dining room table will be under your work surface, you'll want to protect it. A covering, such as newspaper or the plastic sheeting used for painters' drop cloths, placed under your work surface will protect the tabletop from paint and/or glue spills. Make sure you have someplace to store your work surface at dinnertime! (Fig.1)

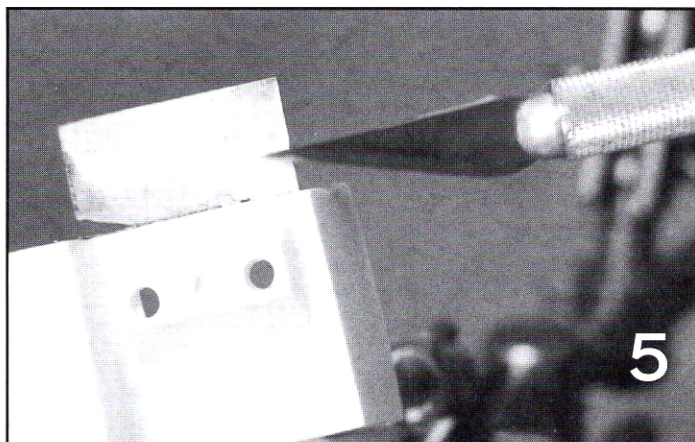
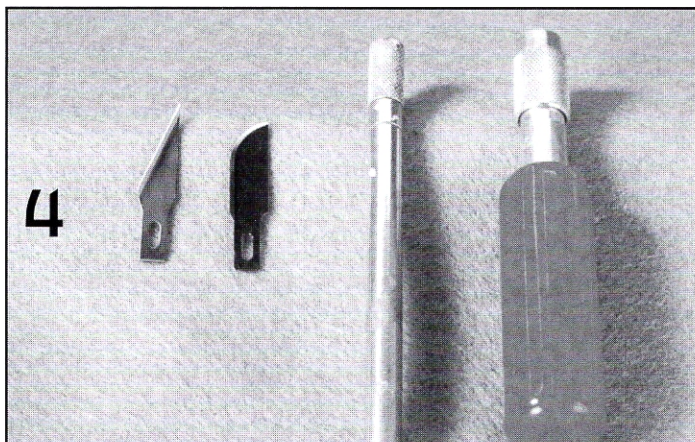
Right: Our subject: the reissue of Robin®.



Above: A portable modeling set-up. Below: Swing-arm lamp (left side of workbench) helps for close work.







Above left: #11, #10 knife blades & handles. Above right: Molding flaws, emphasized with a black wash.

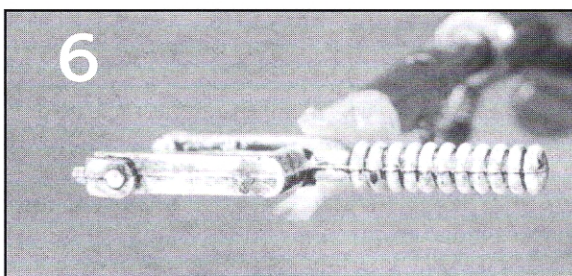
Once you've chosen your work area, you'll need to light it. Any form of overhead lighting will do for general purposes. But you'll also need a closer, brighter light for fine work. I use an inexpensive swing-arm lamp with a 60-watt bulb in it. The lamp clamps to the side of my workbench, and can be adjusted to place the light exactly where I need it (Fig. 2).

Two more items you'll find useful are a comfortable chair and a wastebasket. Note the word "comfortable" - you'll probably spend hours at a time in that chair! The wastebasket will come in handy to catch all the debris that accumulates from the building process. You'll need it sooner or later, so you might as well provide for it now.

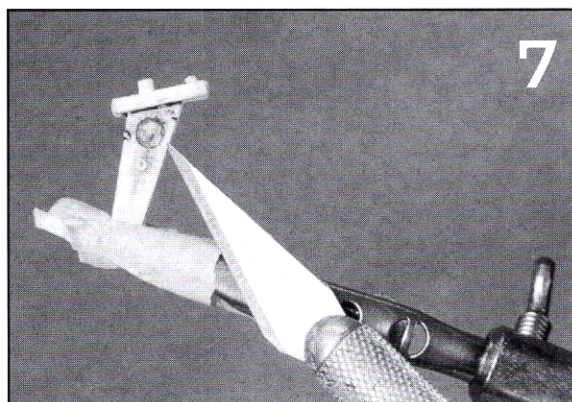
Okay, enough lecturing - let's start building already! The subject of this series will be Revell-Monogram's reissue of the 1966 Aurora Plastics Corporation model of Robin, the Boy Wonder (Fig. 3). This is a figure model, but the base also has "hardware" elements. I hope the treatment of the base will be useful for MR's Sci-Fi readers. Most important, I've never built this model before, so we'll all be learning something new!

The first step is the easiest. Take out the instructions and check to see that all the parts and decals are in the box. This way you'll know if everything is there and whether or not the parts are in good shape - occasionally an incomplete or damaged part will crop up. If you find such a part, or a part is missing, you have two choices. You can either return the kit to the place of purchase (which may not always be possible), or you can contact the manufacturer and try to get a replacement part. Many are happy to do this, but if the kit has been discontinued, you'll have your work cut out for you.

My sample of the Robin kit is in good condition. The next thing I do is to wash it carefully in soap and water. Doing this removes the thin coating of oily mold-release agents, used in the manufacturing process, from the plas-



Above: Close-up of part w/ mold-parting line on it.



Above: Close-up of part w/ ejector-pin mark on it.

tic parts. These substances might interfere with the adhesives used to assemble the kit. So I scrub the parts with an old toothbrush dipped in cheap dish soap. I rinse the parts with warm water, and allow to air dry.

When they've dried, I can prepare them for assembly. For that I'm going to need a hobby knife. This is perhaps the most necessary tool for any modeler. The best-known brand is X-Acto®. Their knives, handles, and related supplies are available in most hobby shops and many hardware and art-supply stores. The #11 blade is good for most work. The #10 blade is similar, but has a curved edge, which is useful for working on round surfaces (Fig. 4). When handling these blades, BE CAREFUL! - they're razor sharp. Sooner or later you'll draw blood with them, I guarantee...

Here are a few hints about buying hobby blades:

Although I mentioned X-Acto, there are several other manufacturers that make knives which are just as good, and may be cheaper. It's often better to buy your supplies in bulk. The hundred-count pack of knife blades costs much less per blade than the standard five-count blister pack. You'll change these blades a lot, because that desirable razor-sharp edge dulls quickly with use.

So here's another hint: Keep a second knife handle to hold that dulled but still useful blade. Label one handle for the fresh blade that has the sharpest point. The duller blade can still be used to scrape seams, apply putty, etc. You'll get more service from your knife blades that way.

Which brings us to hint number three: When you dispose of these blades, do so safely. Some dispensers have a slot into which you can shove the dulled knife blade. If you must throw the blade into the trash, wrap the cutting edge with a piece of masking tape first. The deep, painful cut you save might be your own!

In plastic modeling, as in many other activities, it



## Modeling Basics...Continued from Page 9

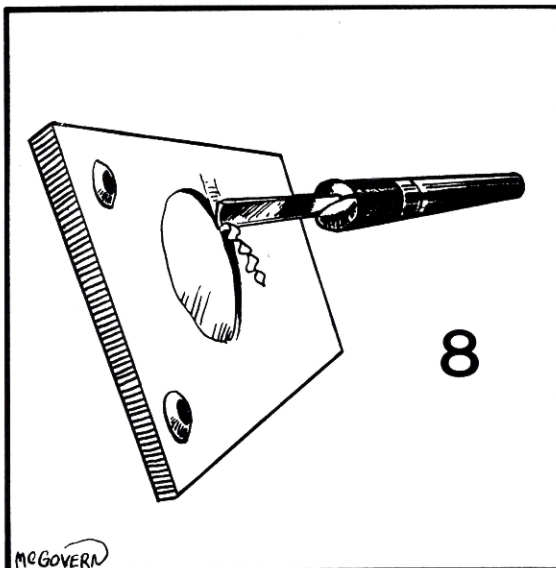
pays to Think Ahead (as my dear old dad always told me). You don't want to cut up your workbench, so a cutting surface is a handy item. This might be as simple as a section of floor tile (which is available at flooring or home improvement stores), a plastic kitchen cutting board (get one of your own - the chef in your home will appreciate it), or a self-healing cutting mat. These mats can be found where hobby or art supplies are sold, but they can be expensive.

Back to Robin: the parts have been accounted for, and the oily manufacturing residues washed off. Now we'll get them ready for assembly.

Those plastic rods that the kit parts came attached to are called sprues. These were the channels through which the hot plastic flowed during the injection-molding process, which formed the model. Very often, sprues are molded with an identifying number for each part. The Robin kit only has thirty-seven parts, so this isn't a big deal. But if you're building something intricate, with perhaps hundreds of parts, then you'll find it a good idea to leave the parts on the sprue until you need them. Also, small parts that have been left on the sprue will be easier to paint.

If you remove the parts from the sprues just by twisting them off, you risk damaging the part. Your hobby knife can cut them off cleanly. If a little bit of sprue remains on the part, it can be trimmed or scraped off. Save those sprues - you'll find many uses for them, as we'll learn later on.

Once the part is off the sprue, you'll want to eliminate the molding flaws left by the manufacturing process. These flaws mar the appearance of the part. Removing them can be tedious, but the effort will pay off by immedi-



Above: Drawing which depicts removal of ejector-pin mark by scraping w/ edge of hobby knife.

ately improving your model's look of authenticity.

Flash is a molding flaw that turns up at the edges of some parts (Fig. 5). This is formed when a little of the molten styrene seeps in between the two molds that make the part. Flash is often caused by wear on the molds of older models. A little trimming will take it off the part. Mold-parting lines are another common flaw to be found on plastic kit parts (Fig. 6). These appear as little raised ridges at the point where the two halves of the mold meet to form the part. A little scraping and sanding will eliminate these lines.

Ejector-pin marks are common on styrene models (Fig. 7). Once the molding is complete, the ejector pins push

against the newly formed kit parts to pop them out of the mold. If the impression of the pin appears in a visible area of the model, you'll want to remove it. Here's where that curved #10 knife blade is handy. Just scrape the side of the blade lightly over the ejector-pin mark until the edges have faded (Fig. 8). A little sanding might be needed to finish the job. Deep marks (or voids) in the plastic surface called sinkholes may require filler (which we'll get to in Part Three of this series).

Yes, parts prep can be a tedious part of your project, but it will ultimately be a rewarding one. Once the appearance of the parts has been refined, it'll be time to assemble them. But what with? We'll examine our choices in Part 2: Glues, Shaping Tools, and Fun With Seams.



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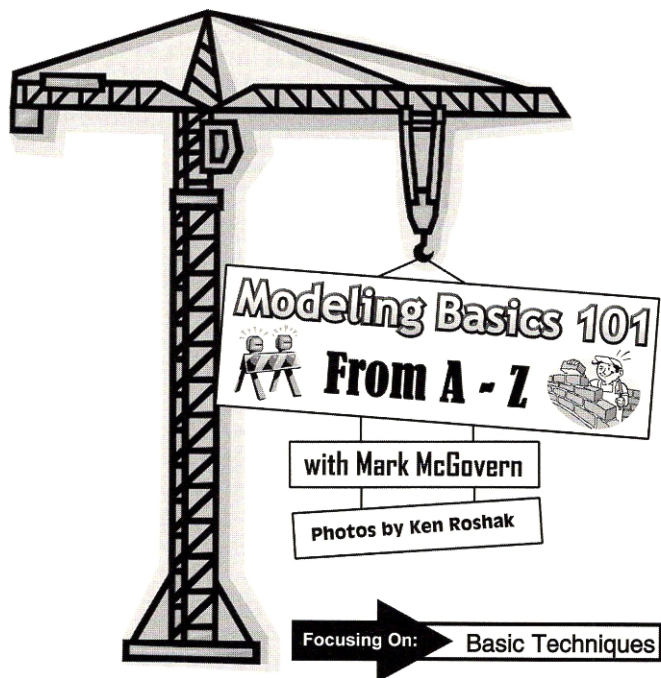
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## Part 2: Glues, Shaping Tools and Fun With Seams

In Part 1, we discussed how this series came to be. Then we looked at the possibilities for a modeler's workspace. Finally we began the building of the reissue kit of Robin, the Boy Wonder by removing the parts from the sprues and molding flaws from the parts. We discussed the types of hobby knives we would use for these tasks. Now we're ready to glue the parts together - but with what? Like just about every other aspect of this hobby, there are plenty of choices (Fig. 1).

Since we're considering injection-molded styrene models primarily, we'll begin with solvent-type glues. These adhere the parts together by chemically dissolving the plastic. Once the glue dries, the parts have been fused together for a permanent bond.

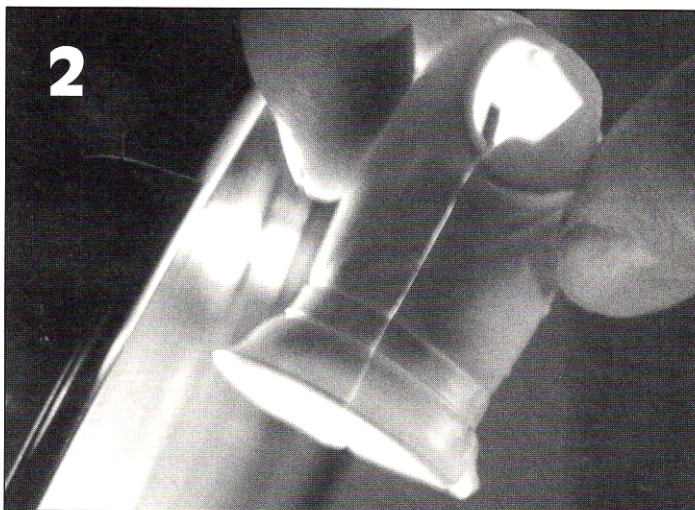
Tube glues are the best-known plastic model adhesives. A filler is added to the solvent, giving it a thicker consistency. This keeps the glue from being too runny, and also imparts a minor gap-filling quality. It takes a little longer to dry, but this can be an advantage if you're dealing with a tricky parts fit that requires some adjustment after the cement has been applied. Tube glue is great for most model building.

Liquid cement has almost as many uses as tube glues. It's essentially the same stuff, but without the filler. Applied with brushes or syringes, liquid cement does the best job of fusing parts together. If the parts fit well enough, you'll see a little line of liquefied plastic ooze out of the seam as you press them together. Once dry, this line of melted plastic can be scraped off; the seam will be nearly invisible. Liquid cement dries much faster than tube glue, so it's best used on assemblies where parts alignment won't be a problem.

There are other adhesives, which are useful for plastic modeling also. Two-part epoxy resins are adhesives composed of an epoxy and its hardener. When the two parts are combined in the recommended ratio they harden into a solid plastic. Epoxy grips tightly, and forms a very strong bond. It's useful not only where you need great strength, but also where you must join dis-

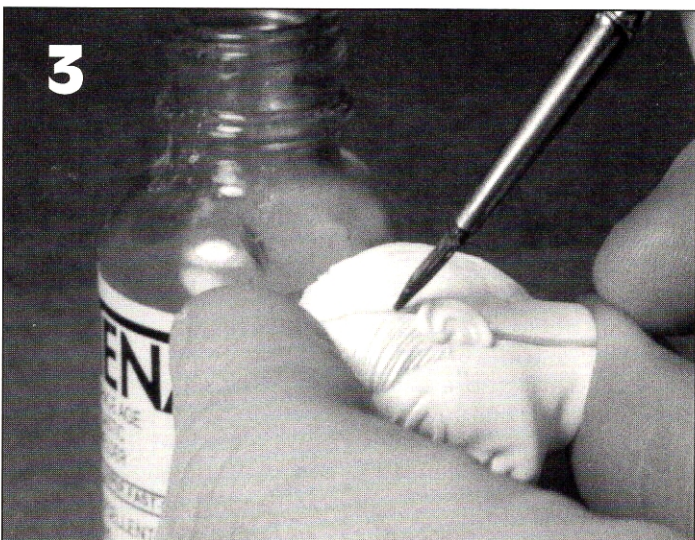


**Model cements (clockwise from lower left): tube glue, super glue & accelerator, liquid cement, white glue and 2-part epoxy.**



**Above: Light shining through assembly reveals the gaps.**

**Below: Liquid cement applied with a brush.**







similar materials, such as metal to plastic. This stuff can also be used as a clear, glossy finish.

Superglues (the gel types) have much the same applications as epoxies. There are many types of superglue made for plastic models. Like the epoxies, superglues have different setting speeds. You'll learn which you like best with a little experimentation.

To speed up superglue's curing process, one uses an accelerator. After the glue is applied and the parts positioned, the accelerator is sprayed or brushed on the glue. The superglue will cure instantly. This makes it ideal for filling gaps (which we'll discuss later on). Like epoxy, superglue can be used to adhere different materials. However, its bond isn't as strong, nor is it of any use as a clear finish.

Note that solvent-type glues are effective only on styrene model kits. Some injection-molded models are made from ABS plastic, which won't be affected by tube glue. You'll need a liquid cement for ABS plastic (such as was used in early Polar Lights kits). And neither of the solvent-type glues, which are used for styrene models, will work on resin or vinyl kits. Epoxies or superglues are used for these types of models.

There are also adhesives specifically formulated for adhering clear parts that might otherwise be frosted by regular model cements. Some of these adhesives can even be used to make things like small-scale windows or the lenses in a pair of glasses. White glues (like Elmer's Glue-All) do this job almost as well. Diluted with water, white glues make a good adhesive for ground work - natural materials applied to make an outdoor scene more realistic (which we'll also get to later).

When working with these adhesives or any of the substances you're using to build models, please remember: SAFETY FIRST! A small circulating fan will help clear away toxic fumes. If necessary, a respirator (available at hardware and home improvement stores) can help protect you from harmful vapors. Remember too, that most of the materials we've looked at are FLAMMABLE. Make sure there are no open flames near where you work or store these items.

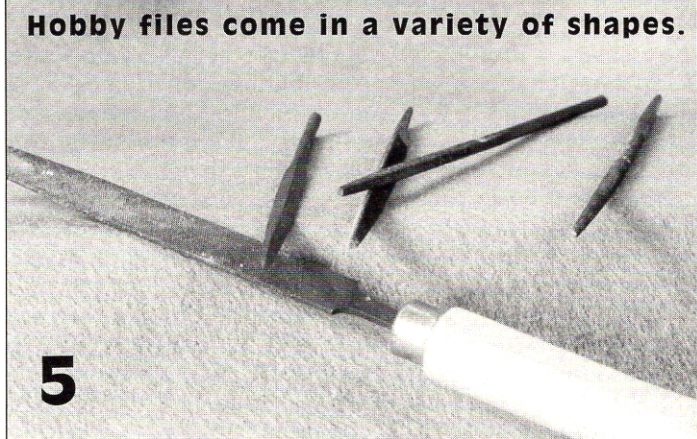
Let's return to our example. Since I've never built Robin before, I'm going to follow the order of assembly as given in the instructions (using a copy of the original Aurora version, not the lifeless pages that came with Revell-Monogram's reissue). The instructions tell me

**Left: The bead of melted plastic indicates a good bond.**

to "Cement BODY BACK (#3) and FRONT (#4) HALVES together." I clean up the molding flaws, then hold the parts together in front of my work light. The light shining through the seam shows me where a little sanding needs to be done to make a tighter fit (Fig. 2). Lightly sanding with 150-grit sandpaper does the job. In the process, I rough up all the mating surfaces, to improve their bond with the cement. I check the fit often to ensure that I don't sand too much.

The seam between these parts will fall along the shoulder of the torso and run down each side. I'm inclined not to fill it. Why? Because most shirts are made in front and back halves, like the model, and have seams in the same areas. So I lightly sand the outer mating surfaces of the parts to round them off, making them look more like cloth. Then I run a bead of tube glue along the inner edge of the mating surfaces and hold the parts together with rubber bands. Once the assembly is dry, I'll go back and deal with the unwanted seams on Robin's collar and belt.

The next two parts to join are the FACE (#1) to the BACK OF HEAD (#2). For this assembly I'll use liquid



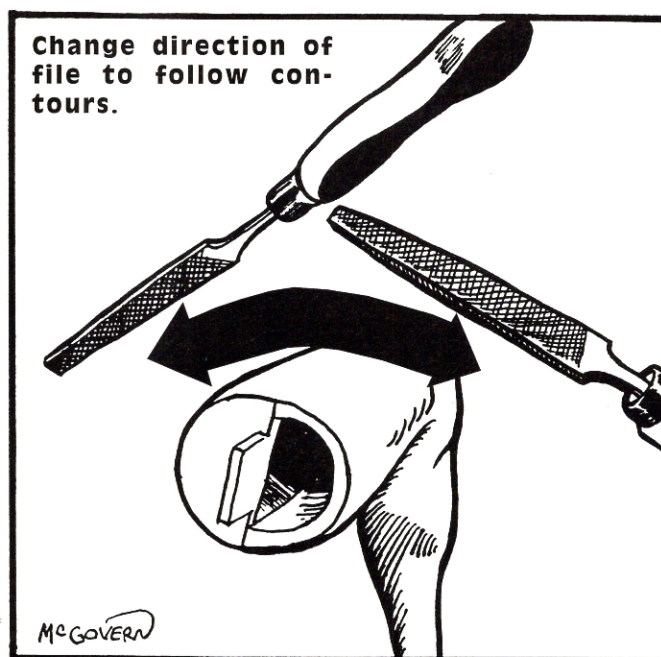
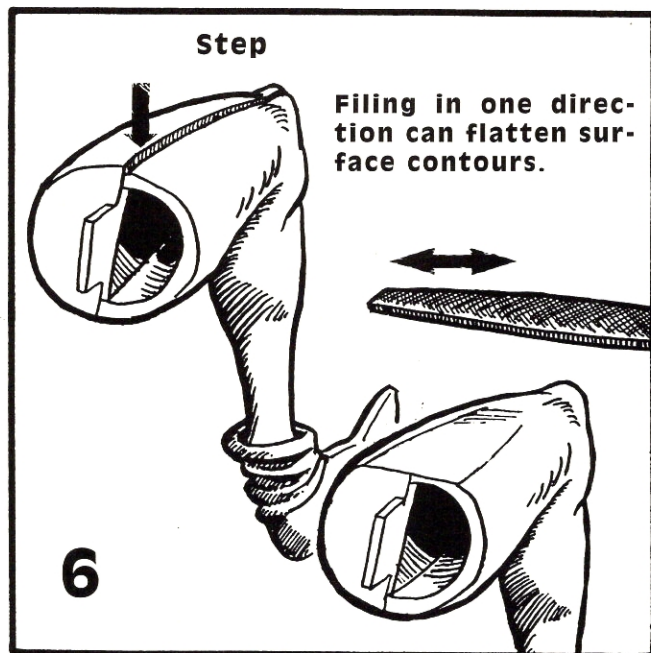
**Hobby files come in a variety of shapes.**

cement, because I don't want any trace of a seam on Robin's head. I hold the two parts so there's a tiny gap between them. Then I touch a paintbrush loaded with the liquid cement to the seam (it might mar the surface of the model a bit, but that can easily be sanded smooth later) (Fig. 3). Capillary action draws the cement along the seam. Then I push the parts together.

I work all around Robin's head this way. Sometimes I must pry the pieces apart with the tip of my hobby knife to make room for more cement as I go. Once finished, about 30 seconds of finger pressure is all I need to get a good bond; the little ooze of melted plastic along the seam confirms this (Fig. 4).

Following the instructions, I assemble the rest of the model. Always trying to think ahead, I keep several subassemblies separate, so I won't have to mask them when I paint. These are: Robin's torso (with cape attached - easier to paint the cape that way), head, arms, trunks/legs, feet, small electronic switch box, flasks, and large electronic box. The molding flaws have been cleaned off all the individual parts that weren't used for these assemblies, and have been set aside for painting.





Although there were some seams I wanted to keep, there were others I didn't want. We'll remove them using shaping tools, beginning with hobby files (Fig. 5). These are made by a number of manufacturers and come in many shapes and sizes. Often, you can find a package containing differently-shaped files and a handle. These are very fine files; you'll find them in hobby or craft stores (not Home Depot...).

For finer work, you'll need some sandpaper. The wet-or-dry type comes in grits ranging from 250 (coarsest) to the thousands (unbelievably fine grit). I find 400-grit is the finest I need for most work. I'll go to 600-grit where I need a really smooth look for spacecraft hulls and the like. I only use those thousand-grit papers for polishing car finishes and clear parts. Wet-or-dry sandpaper can be purchased in packages or single sheets at hobby and hardware stores. Auto-supply stores carry the really fine grits.

Let's put these tools to work on Robin. I suggested in Part 1 that most of the molding flaws on parts could be removed with your hobby knife. However, that's rarely enough to provide a clean appearance. Often a little filing and sanding are in order.

Sometimes a step is unavoidable when two parts are assembled (Fig. 6). The step results when the two shapes don't match properly. You might have been able to get one side of the assembly to fit okay, but not the other. Then you'll need to file the step down until the two parts are level.

The shape of the file you use will depend on your preferences and the contours of the area you want to level out. The important thing is to use your file with a light touch - it's really easy to chew into the plastic, or to flatten a rounded shape. Try to follow the contour of the assembly as you file, and keep checking the surface. If you hold the assembly so that light reflects along the seam, you'll be able to see when the tooth marks from the file are running continuously over it. That's when it's time to stop.

The marks from the files will show up under your

paint, so you'll want to sand them off. Or maybe you scraped the seams or molding flaws with your hobby knife, and still have some rough spots. Either way, this is a job for sandpaper.

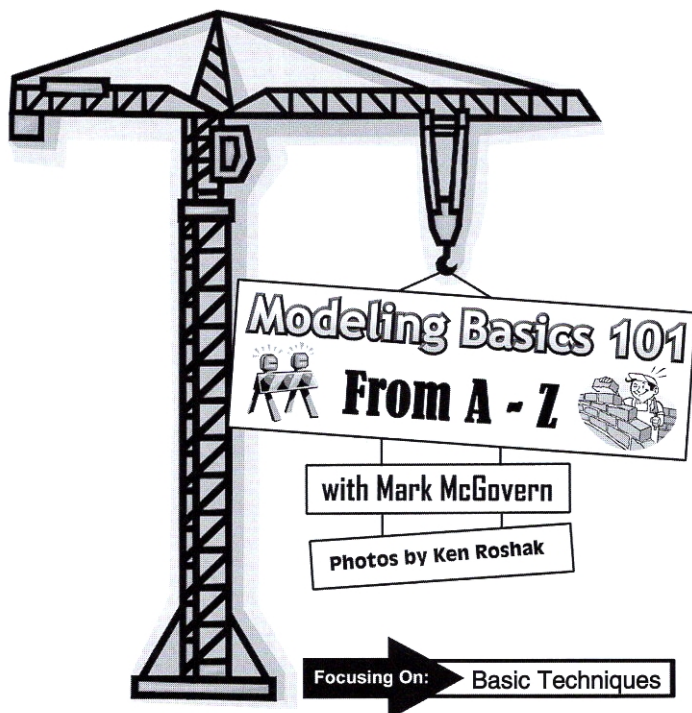
I start by tearing a small hunk, maybe two inches square, off my sheet of wet-or-dry sandpaper. If the flaw is pronounced, I'll begin with the coarsest grit, the 250. First I mark the back of the paper with a pen, so I'll know which paper is which (unless, of course, the piece I tore off has the grit number printed on the back). Then I dip the paper in a little water - I keep small containers, such as yogurt cups, handy for this sort of thing. I blot off the excess water on a paper towel, then sand the flaw. (I used the bold type on these items because they will be useful for you to have on your workbench sooner or later).

As I work I wipe off the mixture of plastic dust and water, called slurry, off the model so I can see how I'm progressing. To keep the slurry from clogging it, I frequently rinse the sandpaper in water. At the same time, I check my progress to avoid sanding a depression into the part. Also, I am careful not to sand away the detail or flatten features like the folds in clothing. To that end, I try to keep the sandpaper from straying too far from the area I want to smooth.

Once the flaw has been sanded out, I'll go over it again with the next finest grit, the 320. In order to tell if I've removed all the previous sanding scratches, I sand in one direction only with the 320-grit paper. When I see that all the scratches are running in that same direction, I know that the 250-grit sanding scratches are gone. Then I move on to the 400-grit paper, this time sanding in a different direction from the 320-grit.

Whew! This part of the job is a lot of work. And yet, for all that filing and sanding, I see that Robin's still got some gaps and voids that the shaping tools couldn't smooth over. We'll cover that problem - literally! - in Part 3: Filling Gaps and Solving Fit Problems.





## Part 3: Filling Gaps and Solving Fit Problems

In the last installment of this series, we looked at shaping tools - hobby files and sandpaper. To illustrate how these items are used, I employed them to smooth over some of the seams in the Robin, the Boy Wonder model. But there were still some flaws with which shaping tools couldn't deal.

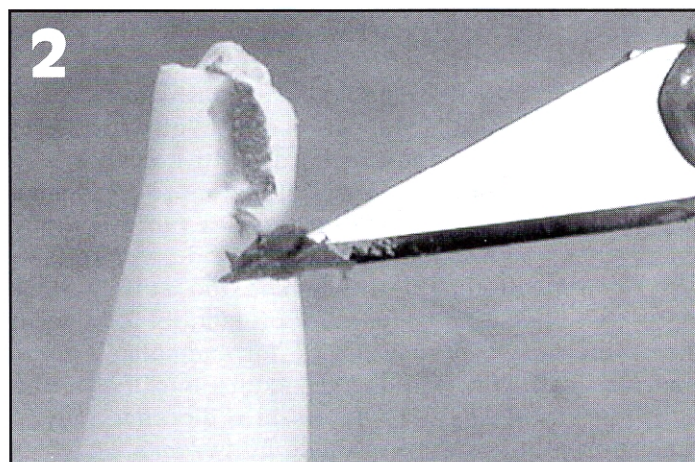
Gaps in seams, sinkholes, deep ejector-pin marks, or one's own mistakes (such as errant file or knife cuts) are part of a modeler's life that can't be avoided. When these blemishes occur below the surface of the plastic, they have to be filled. There is a wide choice of fillers available (Fig. 1).

Solvent-based putties are the most common fillers. The solvent chemically "bites" the plastic then evaporates, leaving the filler stuck in place. It's possible to thin the putty with a compatible solvent, or smooth it with a brush wet with the thinner.

However, the putty will shrink slightly as the solvent evaporates. Therefore, the more solvent that is added to the putty, the more the putty will shrink when it dries. One way to avoid this problem is to apply several thin coats, rather than one thick one, to an area that must be built up. Most solvent-based putties dry softer than the surrounding plastic, and can be easily filed and sanded smooth.

Generally, these putties are packaged in tubes. You'll be able to find them pretty much wherever hobby supplies are sold. Solvent-based putties are formulated primarily for styrene models. While these putties work

**Below: Various fillers: solvent-based putty, 2 part epoxy putty and super glue.**

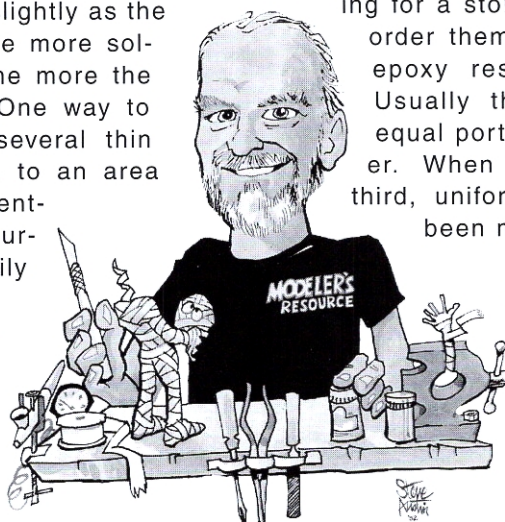


**Fig 2: Applying putty: a little dab'll do ya!**

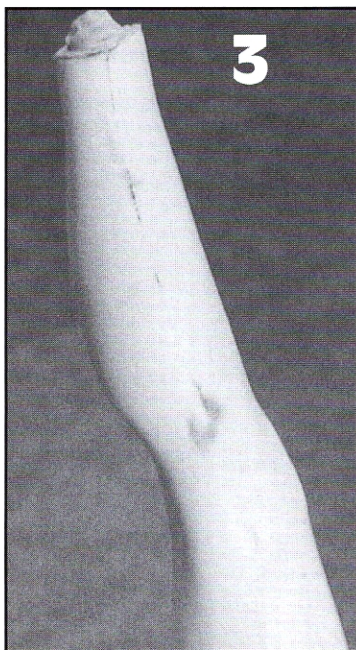
okay on resin and vinyl kits, there are other selections, and these will also work on styrene models.

First, let's consider two-part epoxy putties. Compared to the solvent-based types there are fewer brands available, so you might have to do a little hunting for a store that stocks epoxy putties or else order them by mail. These putties, like their epoxy resin cousins, come in two parts. Usually these parts have different colors; equal portions of the two are kneaded together. When the two colors have blended into a third, uniform hue, you'll know the putty has been mixed thoroughly.

Epoxy putties cure slowly - some take overnight to harden completely. This feature makes it great for use where some shaping or sculpting needs to be done. You'll have a certain amount of working time before the putty becomes too stiff to use. Experience will teach you







**Fig 3: Feathered edges won't show up under paint.**  
**Fig 4: Scribing restores a smoothed-over recess.**  
**Fig 5: The darkened area is an epoxy putty addition.**

how much time you have to work with the brand you're using.

However, it's also important to learn to estimate how much putty you can use in the allotted working time before it becomes too hard. You don't want to waste this stuff, as it is considerably more expensive than solvent-based putty. So here's a hint for those times when you find that you have mixed up more than you needed, or that it's becoming too stiff to work with: try to use it on some other project, to add weight inside the legs of a vinyl figure for example. Failing that, you can work a rock-like texture into the curing putty for use later on as debris in a diorama, maybe (sad to say, I have a lot of those putty rocks...).

There are epoxy putties, which are less expensive than the hobby brands available in the plumbing departments of hardware and home-improvement stores. These products cure with a grainy texture to them, which you may or may not find desirable. They're good for applications where the appearance of the putty won't be of much concern - reinforcing an assembly from the inside, for example.

The advantage of epoxy putties is that, when hardened, they are very strong. Not only can you fill gaps with them, you can sculpt raised features or even new parts. And most of these putties are water soluble until they cure, so you can smooth them with a wet brush or finger.

We talked about gel-type superglues as adhesives in Part 2. They can also serve as gap fillers. You just squirt the glue in

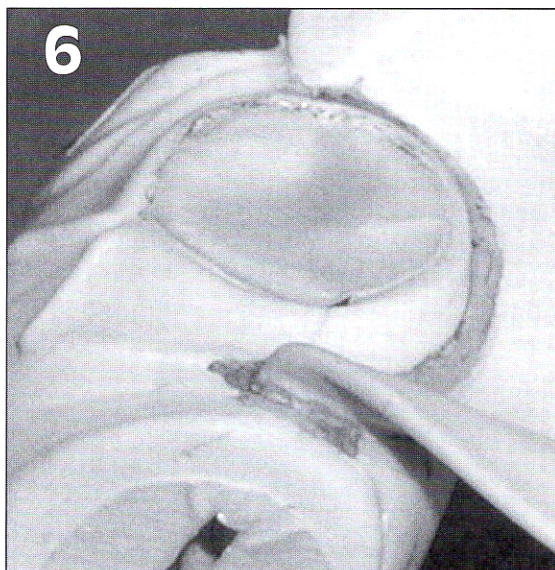
the gap. Spraying the glue with accelerator will make it cure instantly. The glue may shrink a bit as it hardens, so repeat the process until the gap has been filled. I have read that sprinkling a little baking soda on superglue will also make it cure quickly. The soda itself acts as a filler, so you'll use less glue.

Once the glue has set, you must file and sand it quickly! In an hour, the glue will have cured harder than the surrounding plastic and be almost impossible to smooth without damaging your model. The fumes from curing superglue can be irritating, if not toxic. They are yet another reason to make sure you have fresh air circulating around your workbench.

For Robin, I think a little Squadron Green solvent-based putty will fill the bill, or rather, the gaps. Because the volatile solvent evaporates quickly, I try to keep the tube open as little as possible, so my putty won't dry out. I take up a bit on the end of my hobby knife (there are many putty applicators available, but a hobby knife works about as well), and apply it to the gap (Fig. 2).

It's easy to let the putty wander over the surface of the model, which is another good reason for working with small amounts at a time. After the gap has been covered, I moisten the tip of my finger with a little water, then press the putty down. This physically forces the putty into the depression, and makes for a smoother surface to sand later. The water keeps the putty from sticking to my finger.

Once the putty has dried completely I sand it with wet-or-dry



**Fig 6: Putty (darkened line) conceals the cape's locator pins.**



sandpaper, following the procedure I described in Part 2. I'm careful to make sure that the edges of the putty are feathered - that is, they fade gradually into the surrounding plastic. That way, I'll know that the putted area won't show up under the paint (Fig. 3).

Occasionally the filler or sanding process will smooth over a recessed feature that shouldn't be filled (panel lines on vehicles are often victims). Scribing is a simple way to restore a recessed line, by running the sharp edge of the hobby knife along the path of the line. Several light passes with the knife blade will give you better control than attempting to gouge a line with a single, heavy stroke. To widen and deepen the line, the back of the knife blade is run along the line. Again, several light passes will get better results than one heavy one (Fig. 4).

Here's a couple of problems I ran into: the fit of the right arm to the torso was very poor. Ordinarily, I'd glue the two assemblies together, then putty over the offending joint. But I knew that it would be much easier to paint the arm and torso assemblies separately. So I smeared a little Vaseline onto the torso, then taped the arm in position. I filled the joint with epoxy putty. The putty stuck to the arm but not the torso, because of the Vaseline. Once I was satisfied that the arm joint would look all right, I removed it from the torso, so the epoxy could cure completely (Fig. 5).

On the other hand, the cape had two mounting pins that fit into holes in Robin's shoulders. The fit wasn't very good; a little of the pins and holes were

visible even after I located the cape into position. Since the assembled cape would be positioned away from the torso, I realized that attaching it to the torso assembly would make it easier to paint. The torso would provide "hands off" support for the cape. Then the cape and collar could both be painted yellow at the same time. Subsequently, the cape/collar line wouldn't be all that difficult to mask off for painting the torso, which would then be supported by the masked-over cape. So I went ahead and glued the cape and torso together, then applied a little epoxy putty to conceal the locator pins and strengthen the joint (Fig. 6).

I mention these items as a way to illustrate that thinking ahead can save a modeler a lot of work later in the project. Which is another reason why I advocate working from a kit's instructions. For this project, they have already served as an inventory to assure that all the kit's parts were indeed in the box when we opened it up. By illustrating how the kit goes together, they help you spot problems before they arise. In fact, I find that it helps to jot down my plan of attack right on the instructions, especially with regard to the painting of the model. And if you like to keep track of how much time you've put into the project, you can just jot down how many minutes each step took right on the instructions.

At this point, Robin has been glued, putted, and sanded. Before I get him ready to paint, I'd like to explore a few options in Part 4: Thinking (Just) Outside the Box/Preparing to Paint.



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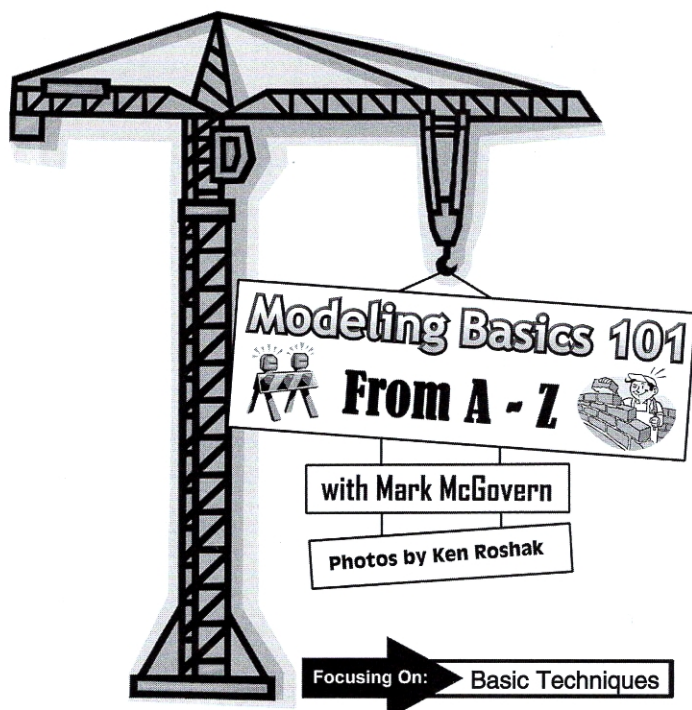
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## Part 4: Thinking (Just) Outside the Box/Preparing to Paint

In Part 3 we examined the different kinds of fillers needed for smoothing over seams, molding flaws or other depressions in the surface of a styrene model. The major assemblies of our example, the Revell-Monogram reissue of the Aurora kit of Robin the Boy Wonder, have been glued together. The seams have been filled and smoothed as needed. The individual parts have been prepped, so that all molding flaws are gone. But before it's time to paint....

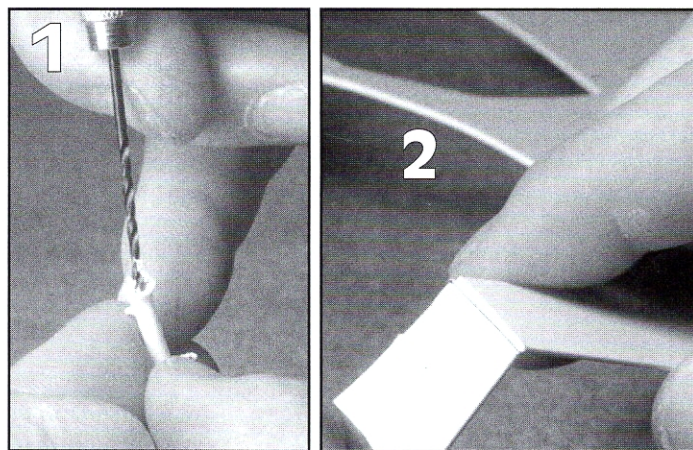
There are some things I'd like to do to improve the model. Little enhancements here and there can help to make it look more realistic. So now, I'm going to do a little thinking (just) outside of the box.

For starters, there are the test tubes. TEST TUBE (#33) will be attached on top of the large electronic box, resting on its side with liquid spilling out. But the test tube is molded as a solid part, with no indication of the open end. So I'll stick the point of my duller #11 hobby knife into the center of the test tube's flat end, and twist the blade around a couple of times. This drills a pilot hole in the end of the test tube.

Next I use a **pin vise** to hollow out the end of the tube. Another hobby store item, pin vises come fitted with chucks on each end. Miniature drill bits are made for these pin vises making it possible to drill very tiny holes by hand. In this example, I drill a nice, uniform hole in the end of the tiny test tube, and voila! - the test tube looks more realistic (*Fig. 1*). The same is done with the other two test tubes.

The back of the CONTROL PANEL BOARD (#19) drives me crazy. Almost without exception, Aurora left the backs of its vertical base elements hollow. Apparently the designers assumed that the finished models would only be viewed from the front. Well, I want my model to look complete when seen from any angle, so I'm going to dress up the back of my control panel board.

First, I'll need a piece of sheet



**Fig 1: A pin vise opens up the solid test tubes. Fig 2: Separating sheet styrene pieces is a snap!**

styrene. It's sold in a variety of thicknesses in hobby stores. The surfaces come plain or with various textures molded into it. Evergreen and Plastruct are the most popular brands and both companies make a wide array of plastic structural shapes as well.

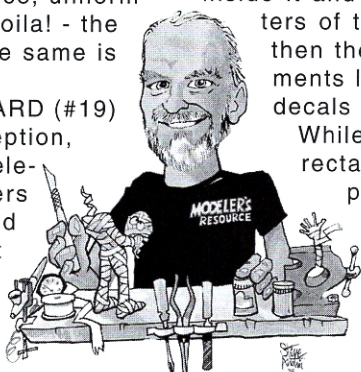
To close off the hollow back of the control panel board, I'll just lay the part down on a piece of .030 inch sheet and trace the outline. Next, I'll use a straight edge as a guide for my hobby knife. A single pass with the knife will be enough; I don't have to cut through the plastic. Once it's scored, I can just snap the plastic apart (*Fig. 2*). With some 400-grit sandpaper, I smooth the edges of the plastic piece.

I cut some smaller rectangles from thinner (.010 inch) sheet styrene, and dress the edges as I did for the larger piece. These smaller panels are glued onto the plastic backing to add a little interest there. Finally, I mark the locations for the panels' fasteners with a pencil, then twist the tip of my hobby knife into the marks once or twice. The knife blade raises small points of plastic, which in this scale look like screws or bolts.

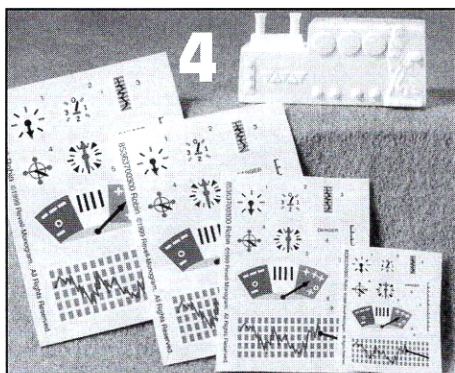
A section cut from a piece of the plastic banding used to strap packages together is glued to my plastic panel also. The diamond pattern of the plastic banding suggests wire mesh; this feature might be a vent. When I'm finished, I cement my new back panel to the control board with tube glue. Now it looks more like a real comic-book villain's control panel (*Fig. 3*)!

Next, there are the raised circles on the small electronic switch and large electronic boxes. These appear to be instrument faces, but unlike the control panel board, no decals are included for them. Although I'm thinking just outside the box, in this instance I go back inside it and pull out the decals. I measure the diameters of the smaller circles on the electronic boxes, then the size of the decals. From these measurements I can work out the percentage to reduce the decals on a copying machine.

While I'm at it, I also lay out artwork for the two rectangles which were molded on the control panel board next to the base of the switch in Robin's hands. On the original issue of the kit, these rectangles were embossed with the words "START" and "STOP." All of these new paper features will be adhered with white glue after the model has been painted. (I produced Robin's







**Fig 3: The hollow kit part closed with a scratchbuilt panel. Fig 4: The kit decals and original artwork can be reduced on a photocopier. Fig 5: Poly Prep removes residues and static electricity.**

chest insignia the same way.) (Fig. 4).

I'm throwing these ideas out as a means of illustrating the different ways by which one can deal with a model's shortcomings. Instead of my solutions, you'll likely find others of your own. And there's no law that says the model couldn't be assembled with alterations at all. The possibilities are truly endless. Most of all, if the model comes out looking right for you, then it's right, period.

But I digress...the time has come to paint the model. First though, consider that we've been handling the parts, sanding them, etc., and although we washed them at the beginning of this project, they're pretty oily and dirty now. These deposits can interfere with the adhesion of paint to the model's surface. So now we need to prepare the plastic to receive the paint.

We'll begin with another wash of all the parts and assemblies in warm, soapy water, as we did in Part 1 of this series. As before, we'll let the model air dry on a paper towel. For some modelers this is enough, but I like to go one more step. I brush on a generous application of Floquil's Poly S Plastic Prep. This is an alcohol-based product that removes the last traces of oils, soap, and other residues while it also cuts the static electricity that can attract dust to the plastic surface (Fig. 5).

From this point on, I handle my model with rubber gloves. You can find them in hardware or medical supply



**Fig. 6: Masking materials: masking tape, scotch tape, Parafilm M, and liquid mask.**

stores. The gloves keep my skin oils off the clean plastic, as I prepare the model for painting.

First, I want to mask the gluing surfaces of the parts so that the paint won't interfere with the adhesives I'll use during final assembly (Fig. 6). I usually use garden variety masking tape for this step. Frosted cellophane ("Scotch")

tape works as well.

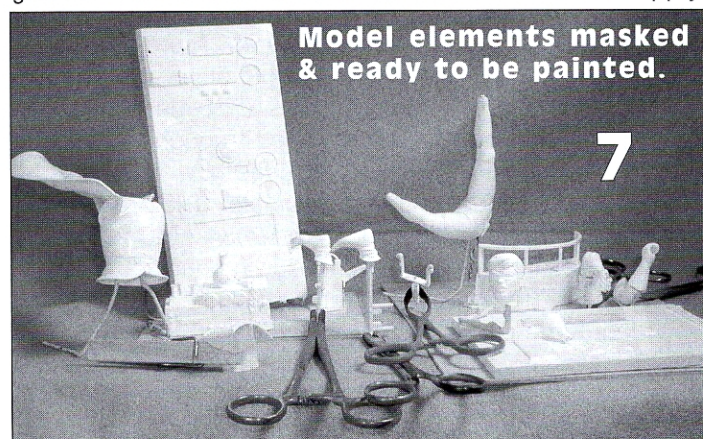
For odd shapes or tight/compound curves (such as the line of Robin's cape collar), Parafilm M is a good choice. Available in hobby and medical supply stores, this is a thin, waxy film that stretches over most any shape. It has a mild adhesive quality that allows it to adhere to plastic as well as itself.

Liquid masks are solutions which can be brushed over an irregular area that would be difficult to mask any other way. Once the liquid dries, the line of demarcation can be cut away with a sharp #11 hobby knife. I've found that this material must be used with care, as it has a tendency to stick to heavy-textured areas. Once the line of demarcation has been defined with a mask, the larger area behind that line can be protected with whatever material, newspaper, cellophane wrap, etc, you have handy.

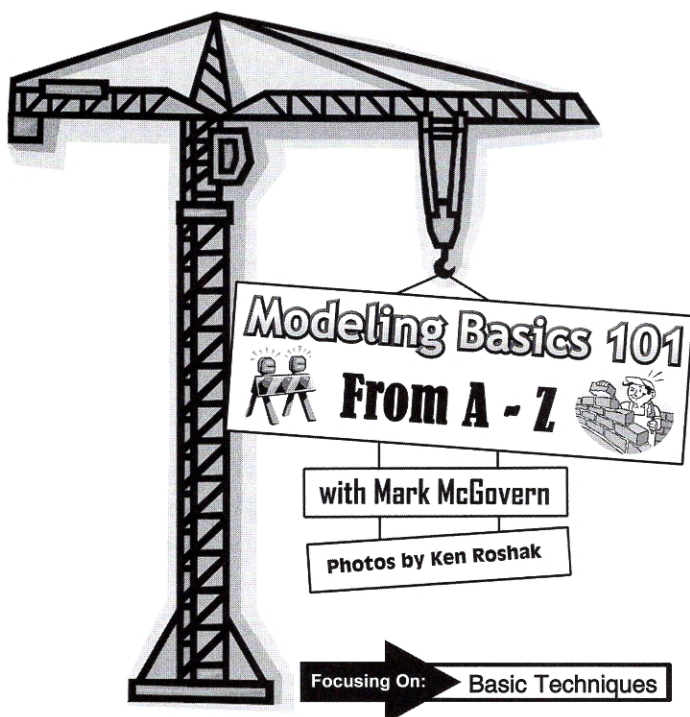
One other masking material is low-tack putty. This stuff is intended for office use, but I find it good for masking crevices. I used small wads of the stuff to mask the insides of Robin's shoes.

The next concern is to find a way to support the parts and assemblies, so the painted portions won't come into contact with anything that could mar the fresh paint. In Part 1, I suggested that small parts can be left attached to their sprues to ease painting. A piece of sprue can be lightly tacked to the items to be painted with a drop of tube glue. Bent coat-hanger wire is often used to support larger assemblies. Vise grips, C-clamps, or hemostats are handy too. The supports can be supported themselves by being taped to a piece of cardboard or any flat, portable surface (Fig. 7).

That's all we can do for now. Even a cursory look at the process of painting a model would take a whole installment by itself. This is why the next one will simply be called Part 5: Paints and Painting.





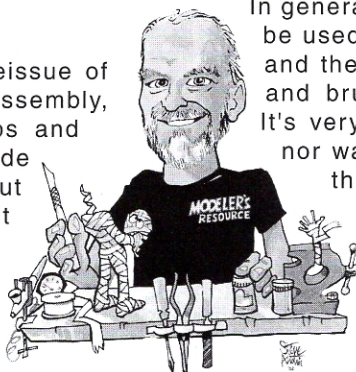


## Part 5: Paints & Painting

We have prepared the kit parts of the reissue of Aurora's Robin the Boy Wonder for assembly, glued them together, and filled the gaps and seams. Then the assemblies were made ready so that we're FINALLY ready to put some paint on them! But first - we ought to examine the paints we'll use on the model and the tools with which we're going to apply them.

It would be well to know a little about the composition of model paints in order to decide which would be the most desirable for your model. Most paints intended for hobby use have three basic components: the carrier, the binder, and the pigment. The carrier, which may be based on either an organic (oil-based) or water-soluble (frequently acrylic) solvent, is the liquid in which the other two components are suspended. When the paint has been applied, the carrier evaporates and the binder dries. The dried binder acts like a glue which holds the pigment to the surface of the model. The various finely ground materials in the pigment impart the desired color.

Your first consideration then will be to decide whether you want to use an organic or water-soluble type of paint (fig.1). Organic model paints offer the hobbyist the greatest variety of colors. Most of the



organic paints can be thinned with mineral spirits and/or lacquer thinner. These liquids are flammable, have a disagreeable smell, are more expensive than water and they must be disposed of properly when they become too dirty.

The water-soluble or acrylic paints can be thinned with water (which has none of the disadvantages I just mentioned) or isopropyl alcohol. The colors you want may not be currently available, but the range of acrylic model paint colors is increasing all the time. Although they don't smell as bad as organic paints, they still give off fumes as they dry. So once again, be sure to have plenty of fresh air circulating around your work area.

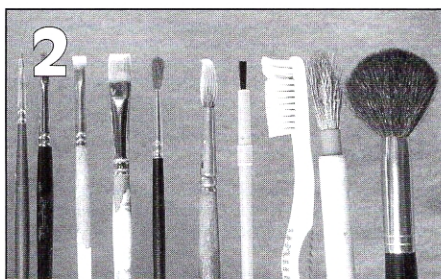
One further note on acrylic paints: there are many water-soluble hobby paints available in crafts stores that are cheaper than those paints which are formulated specifically for plastic models. Some modelers rave about these craft paints. I myself haven't been able to make them perform very well and I don't know how well they hold up over time. I have used them for small details and to color the ground work on bases. The choice is up to you; probably you'll wind up using several different types of paint as you learn which works best for various applications.

In general, the material that thins the paint can also be used to clean brushes and painting equipment, and there are plenty of other choices for thinners and brush cleaners besides those listed above. It's very important to remember: neither organic nor water-based paints can be mixed! Also, the thinners for one type of paint cannot be used to thin the other. The exception to this rule is that lacquer thinner seems to dissolve most types of dried paint from brushes, etc. Don't try to use lacquer thinner to remove dried paint from a styrene model, though - it will melt the plastic.

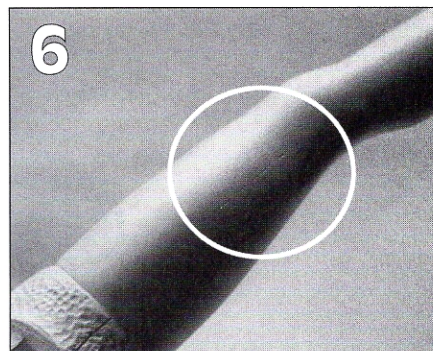
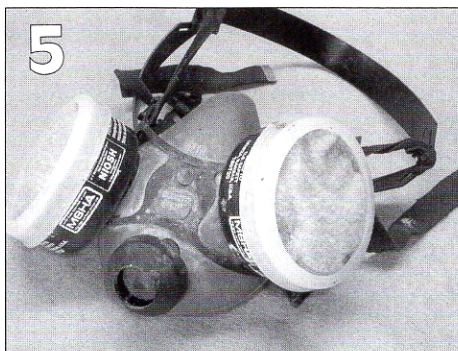
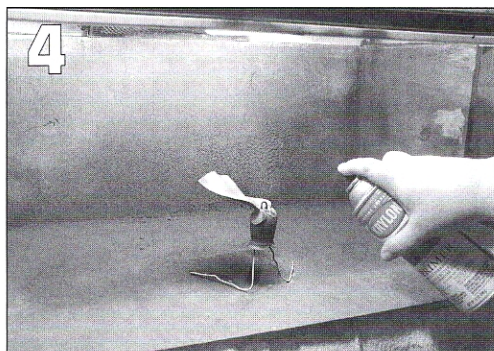
The brushes with which you'll apply your paints come in a vast number of materials, shapes, and sizes (fig.2). What sort of brushes you'll use will be dictated by the kind of paints you're applying, how big an area you want to cover, and what technique you're using to apply the paint. You'll find it desirable to spend the extra money to get the best quality brushes you possibly can. You'll suffer sticker shock even if you shop around; wait for sales at the art-supply and crafts stores, etc. But it will be worth the investment.

Some of the brushes you can see in the photo weren't pricey at all. The big fluffy one on the far right came from the cosmetics department of a drug store. I use it to dust off my models at contest time.

**Fig 1: A small selection of the many types of paint for models. Fig 2: There are brushes for every job. Fig 3: These are the spray paints we'll use on Robin.**







**Fig 4: Safety first! A spray booth vents harmful fumes and dust outdoors. Fig 5: Respirators keep harmful dust and fumes out of YOU. Fig 6: ACK! The primer shows an area that still needs work.**

In order to make the most of those costly brushes, you must take good care of them. Clean them in the material which is appropriate for the paint you're using as soon as you're done painting. Swish the brush in the cleaner; avoid grinding the bristles against the sides or bottom of the container - they can be cut off by the ferrule (the metal band that holds the bristles to the handle). It helps to wash the cleaned brushes in soap and warm water to remove any residue left by the brush cleaner. Restore the bristles' shape with your fingers, and if a protective sleeve for the bristles came with the brush, use it. Store your brushes upright, resting on their handles, NEVER on the bristles.

It's difficult to cover large areas with paint brushes, even the widest ones. The simplest answer to this concern is the aerosol "spray paint" can (fig.3). It's good for applying primer and base color coats to a model quickly and smoothly. However, the paint just shoots out of the can (which is why they're sometimes called "spray bombs"), so you'll need to prepare to paint safely before you start shooting.

If you can spray outside, no problem. But as the weather doesn't always cooperate, you'll need to be aware of the hazards of spray painting indoors. The big danger is that the carriers for almost all spray paints are organic compounds, and therefore both toxic and flammable. Any open flame - the pilot lights of gas appliances, for example - could ignite the airborne

fumes. Because they are toxic, you'll also want to avoid inhaling these fumes. Overspray, the paint that misses the surface of the model, is another problem. The pigment dries in the air and then settles as colored dust everywhere. You don't want to ingest this dust either.

The best answer to these concerns is a spray booth (fig.4). The box itself contains the overspray while a motorized fan vents the dust and the paint fumes outdoors. The booth should be equipped with an offset motor for the fan. In this arrangement, the motor is outside of the flow of vented air. Otherwise, a spark from the motor could ignite the solvent fumes as they pass over it. The spray booth will also require a light source to illuminate its interior.

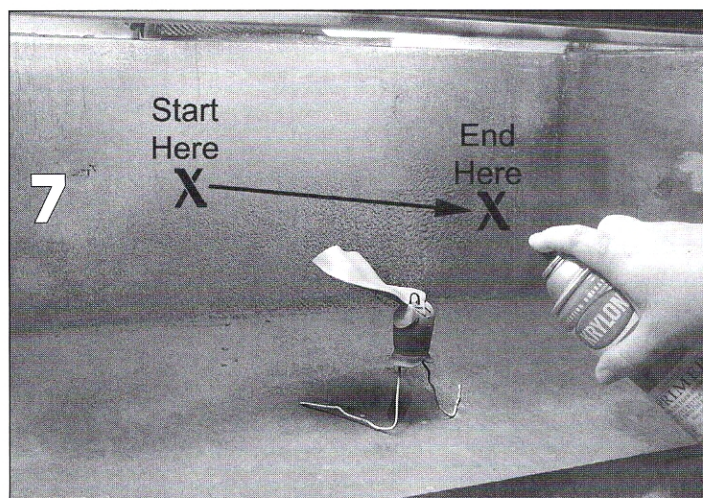
A spray booth alone isn't enough to protect you from the overspray and fumes. A respirator (fig.5) is also necessary. These are available at hardware stores. Don't try to get by with those white paper dust masks - they can't prevent you from breathing in the toxic paint fumes. All this may seem like a lot of trouble and expense, but remember...you only have one set of lungs!

Once you're properly equipped, you're ready to paint. Let's turn back to the model on which we've been working, Robin the Boy Wonder. We'll begin by spraying on the base coats.

The first application I'll use is Krylon Sandable Primer. There are several good reasons for applying primer to a model. First, the monochrome primer makes surface flaws much easier to see and correct (fig.6). (If you must apply putty over the problem area you'll have to sand away the primer first, as the paint will interfere with the putty's adhesion.) It also "levels" the different textures over which it is applied, be they plastic, putty, or any other material. Therefore, the color coats which are applied over the primer will have a uniform appearance. Finally, primer is formulated to provide better adhesion for the paints which are applied over it.

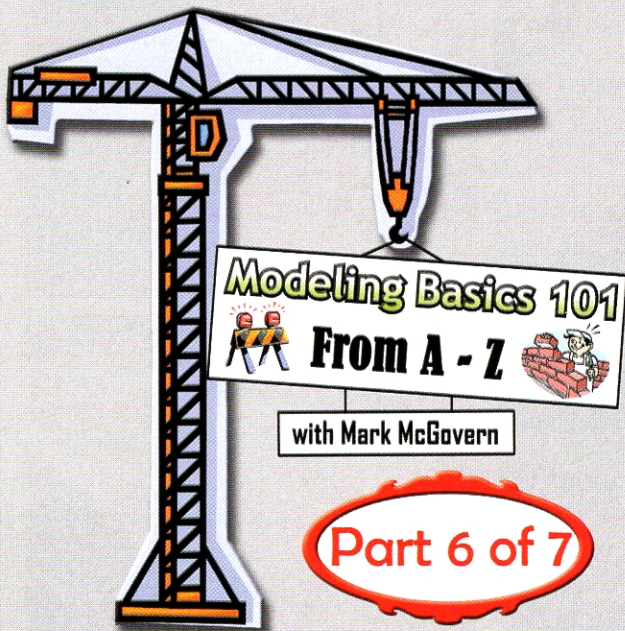
To begin with, I place the can of primer in a pot of warm - NOT HOT - water. Hot water could cause the pressurized can to burst. I only want to warm the paint so that it will spray more smoothly. While the paint is warming, I place the various model elements near my spray booth, where they'll be handy for painting. At this time I don a shop apron and my respirator. I also put on a pair of rubber gloves, which will keep the paint off

**Fig 7: Spraying starts before the pass is made and stops after paint passes the assembly.**



• Continued on Page 26 •





1) Assemblies with first color coats applied

First of all, I must apologize for having taken so long to get the last parts of "Modeling Basics 101" out. Other projects crowded out these installments of the series and I had some of that annoying non-modeling stuff of life to wrestle with too. But finally, we're all together again to finish Revell-Monogram's reissue of the 1966 Aurora model kit of Robin, the Boy Wonder. The previous installments in the series appeared in *Modeler's Resource* issues 48, 49, 50, 51 and 52.

We began by opening the box, checking the parts and preparing them for assembly. Along the way we looked at the most useful tools for this job and also at the variety of adhesives available with which to assemble the model. Once the basic assembly had been completed, we considered the best way to deal with the seams between the parts, the fillers required for the job and the tools we'd need to smooth over the seams. We looked at a few ways to go a little outside the box to add detail to the model without too much effort. Then we prepared the model for painting.

At the end of Part 5 of this series we left the model with a coat of Krylon Gray Sandable Primer applied to the various subassemblies. The primer was sprayed on from a can, the hazards and safety concerns of which were discussed in that article. If you haven't read Part 5 before, please do so before you spray paint. The safety tips given there could be invaluable to you.

In Part 4 I mentioned that when handling the model prior to painting, it's a good idea to wear rubber gloves when handling the model during the painting stages. They keep the oil and dirt from your fingers off the surface. These contaminants can interfere with the adhesion of the paint.

#### To The Spray Booth, Robin!

In Part 5, spray cans were suggested as about the quickest and most convenient way to apply paint to large areas. Now that the assemblies had been primed, I could proceed to the color coats.

It's usually best to spray a model from the inside out - that is, from the most recessed features to the outermost areas. As a rule, it's better to apply the lightest colors first because they are easier to cover with darker colors rather than vice versa. These were the main principles that guided me as I sprayed the first color coats on the model.

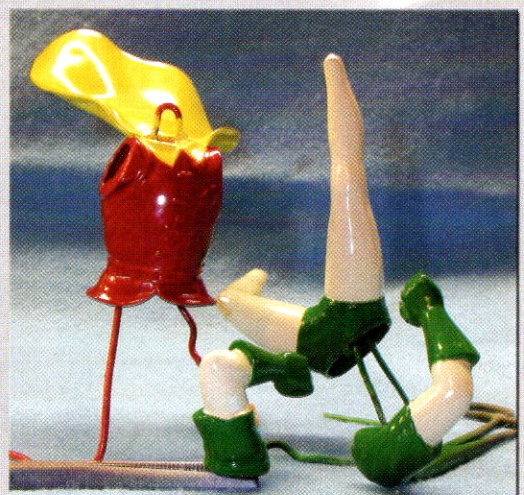
I wanted the colors on the Robin figure to look bright, so I began by spraying the figure assemblies with a couple of light coats of flat white. This allowed me to apply fewer color coats to achieve those bright colors; I'd have needed much more to cover the dark gray primer. (Frankly, I should have used a white primer on the figure to begin with...duh!).

Robin's cape was painted yellow, the lightest color, first. I found an almond color that seemed about right for his youthful flesh tone, so this was sprayed next. You'll notice that some of these light colors got on adjoining areas (**photo 1**). Darker colors later would cover these features, so I didn't bother with paint masks at this stage.

I didn't like the color scheme suggested by the instructions that came with Revell-Monogram's reissue of the kit, so I went with the original Aurora instructions. They indicated that the control panel board and base were to be painted gray and the two

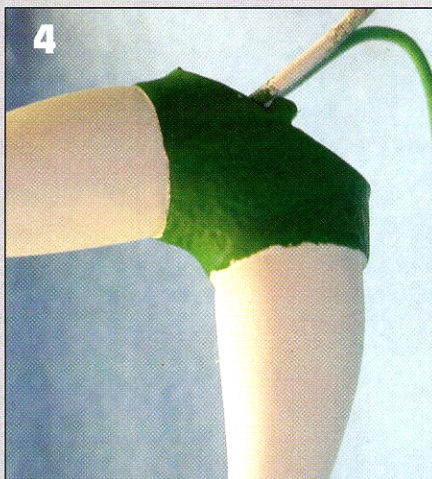


2) Cape masked off

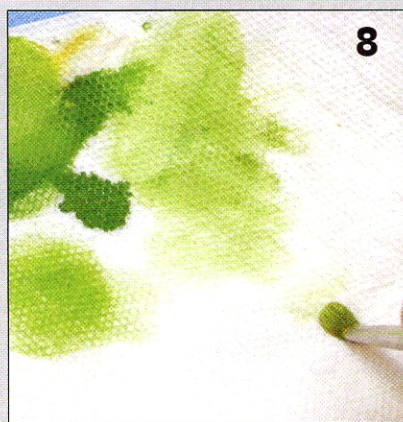


3) Assemblies with second color coats applied





**4) Trunks base coated green. 5) Brush drawing wash up side of yogurt cup. 6) Trunks with black wash applied. 7) Dipping into paint in bottle cap. 8) Brush wiped on paper. 9) Trunks with green dry-brushed.**



electronic boxes, dark gray. I sprayed all these elements flat black for starters. The control panel board was painted silver over the flat black undercoat. Eventually the board, boxes and floor would have the gray shades mentioned above, but I got there by various means.

#### The Model Behind The Mask

I let the first applications on all the assemblies dry overnight for the flat paints and a few days for the gloss colors, to allow them to cure completely. (To save space here, just remember that I always allow any paint or glue applications to dry, cure, set, or whatever, before proceeding to the next step. Patience is one of a modeler's most important tools!) Now I needed to apply a second color alongside the first ones on several of the assemblies. In Part 4 of this series we examined the many kinds of masking materials that prevent one color of paint from being covered by the next color being sprayed.

Different kinds of these masking materials are better suited for different jobs than others, but there's no single material that works for everything. One thing that all masking agents seem to have in common is that the longer a mask remains on a model the firmer the grip of its adhesive can be. Therefore it's best to remove the mask as soon as it can be done without damaging the paint.

The first area I masked was the cape and collar from the upper torso assembly. Robin's collar had fairly simple, straight edges because the portion of his vest on which the collar lay was pretty flat. So I masked the collar with blue painter's masking tape. It was too wide to smoothly cover the collar or follow the compound curves of the torso. So I stuck a length of the tape onto a piece of glass, then cut the tape lengthwise into strips about 1/4"

wide. This made it flexible enough to get around the curves where the cape met the vest.

Once I'd established the line of demarcation between the yellow cape and red vest, I covered the rest of the cape with a piece cut from a plastic grocery bag. There was no need to use expensive masking materials to cover the larger areas of the model. I just wanted to keep the next color off them, so anything that would separate the colors would do (photo 2).

Where I could I masked off all the matting surfaces of the subassemblies. Paint on these areas could have prevented the cement from working properly. I might have just scraped paint off the matting surfaces (and did, in some instances) before applying cement, but that would run the risk of damaging my paint job. Now it was time to put the paint cans away and break out the paint brushes (photo 3).

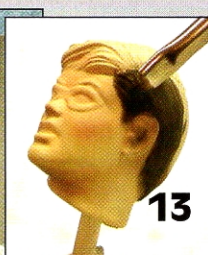
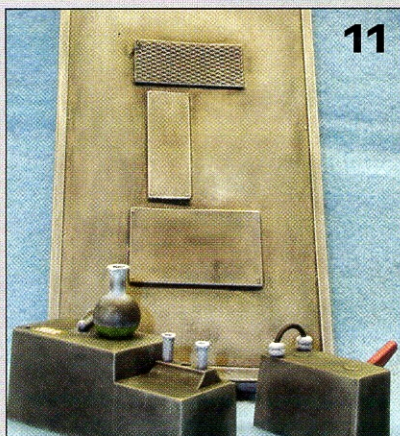
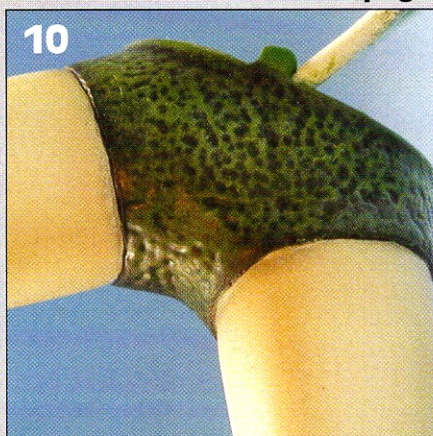
#### Washing Day

An actor has to project his features across a theater by exaggerating the contours of his face with makeup. To do this, the shadows and highlights on his face must be delineated with greasepaint. Otherwise the flat lighting on stage and the distance between it and the audience would "wash out" the actor's features, making his performance less effective.

A scale model needs to be treated in a similar manner, for similar reasons. Its small scale makes its details hard to see the way distance does (in 1/8 scale, for example, a figure seen from only a foot away appears as it would if the full-size subject were eight feet distant). Most room light is so flat and non-directional, it flattens the textures on the model's surface.

The basic applications of paint I'd applied so far did nothing to bring out the details and textures on Robin. At best the model





**10) Trunks with highlights drybrushed. 11) Painted electronic control board and electronic boxes. 12) Scraping chalk over sandpaper. 13) Application of chalk to Robin's head. 14) Base sub-assemblies painted. 15) Photo of tape being pulled back off model.**

had a toylike appearance. So the next step was to apply a few basic techniques which enabled me to exploit the best features of the model and give them greater depth.

Robin's green trunks, with their highly textured surface, provide a good example of how much could be done (**photo 4**). To begin with, I wanted to darken the recessed detail. For this I mixed up a batch of thinned flat black paint, called a wash.

A wash must always be made from the solvent that is specific to the paint that is being thinned. That means water or their specific thinners for acrylics, mineral spirits for most oil-based paints, etc. The idea is to get the paint thin enough to allow it to flow into the recesses of the surface details and darken them. The tricky part is to keep the wash from being so thin that it doesn't darken the details enough, or so thick that it ends up merely painting the model black.

At this point I should mention that there are concerns about whether the wash should be made from the same kind of paint as the color coat over which it is to be applied. The problem is that the solvent in the wash might loosen the underlying color coat. That could cause the base color to mix with and muddy the wash. Many modelers contend that a water-based wash should be applied over an oil-based color, or vice versa.

My experience has been that as long as the base coat has been allowed to dry thoroughly - at least overnight - then a wash of the same kind of paint can safely be used. The wash must be applied quickly and with as little scrubbing with the paintbrush as possible. Otherwise it may indeed disturb the underlying paint. On the other hand, using the same kind of paint for the wash and the base coat eliminates any possibility of a bad reaction. That can occur when acrylics are used with oil-based paints. I just stick

with oil-based paints; experience will help you decide what works best for you.

I made the wash for Robin by pouring some clean mineral spirits into a plastic yogurt cup; a little thinner goes a long way for this. Next I used a disposable plastic eyedropper (which are made by Testors among others and are available at many hobby shops) to drop the flat black paint into the thinner. I checked the opacity of the wash frequently by brushing the paint up the sides of the white plastic cup (**photo 5**).

Once I thought I had it, I brushed the wash onto the trunks. It stained them to a dark, blackish-green. (Actually, I got the wash on Robin's trunks a little too dark - **photo 6**.) I went on to wash the gloves, shirtsleeves, tunic and the control board panel (which had been basecoated with silver). The flat black wash was not applied to the yellow cape.

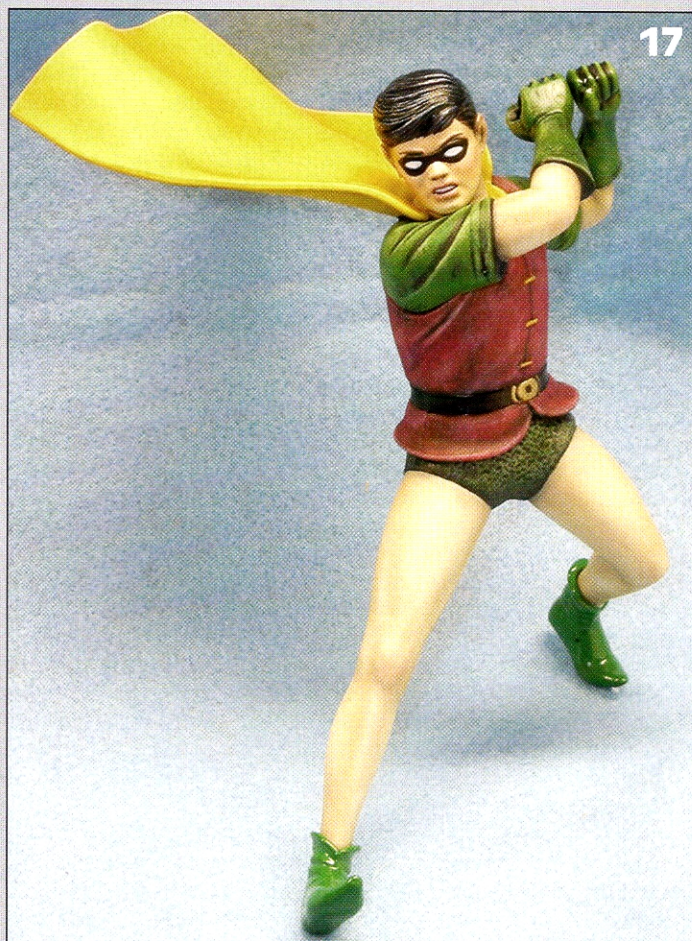
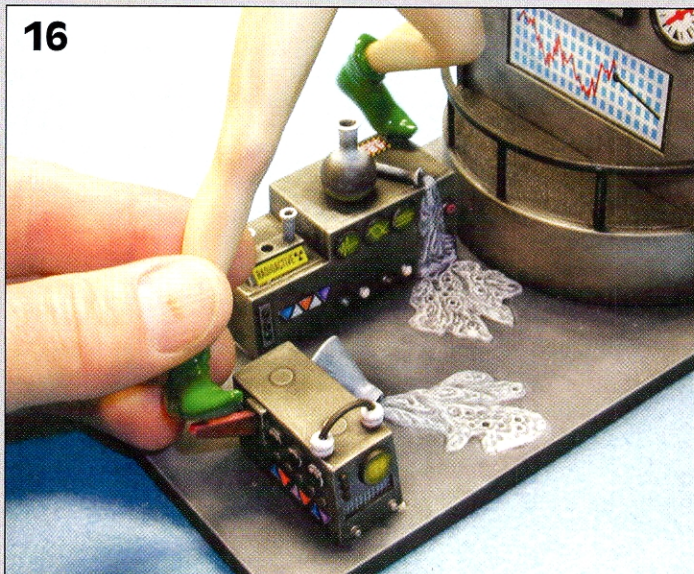
Although I used black paint for the wash I applied to Robin, other colors can be used. For example, dark brown would look good over a tan base and a wash doesn't have to mean a dark color applied to a light one, either. A wash of light red-orange applied to a dark steel color will create a very convincing effect of "rust."

#### How Dry Was My Brush

I had darkened the recessed areas of the model. Now the next step was to restore the colors of the raised areas, although I actually wanted to highlight the raised areas with lighter shades of the base colors. These effects were achieved with a technique called drybrushing. Tiny amounts of flat paint (gloss colors don't work with this technique) were lightly applied to the higher features of the surface with a paintbrush which had almost no paint on it. Only the raised areas received the lighter colors of paint, leaving the wash-darkened recesses intact.

This process would be hard on brushes, so I used an old, short-bristled one. The procedure was to get only a little paint onto the end of the brush. To do this I shook up the paint, removed the





**16) Fitting the feet/legs to the base. 17) Close up of model with various clear finishes applied.**

cap and placed it upside down on top of the bottle. I dipped only the tip of the brush into the little puddle of paint that the shaking left on the inside of the cap (**photo 7**). A ring of paint got deposited on top of the cap - a bonus, since this would identify the color in the bottle after the cap has been replaced.

In order to remove excess paint, I scrubbed the brush onto an absorbent surface. Rags or paper towels are okay for this but can leave lint on the brush, which might get transferred to the model. I like to recycle paper that has been printed on one side - why waste the perfectly good unprinted side? (Bad computer print jobs and junk mail letters are good sources for this.) I brushed back and forth with sort of a sweeping motion until there appeared to be little or no paint left on the brush (**photo 8**).

Most often I brush in one direction over the surface I want to lighten. What direction I follow is determined by the fall of overhead lighting on the model; I want to enhance it, not fight it (although I have seen models where special effects were obtained by painting them as if they were lighted by a light source from some other direction).

If I'm drybrushing properly, the raised portions will pop out against the recesses. Too much paint on the brush will leave streaks on the surface. Sometimes it takes several drybrush applications to get the full effect. Also it's often necessary to let a coat dry hard before drybrushing more, because the brush can actually scrub off the previous application. (Robin's trunks got a little shiny because the brush actually buffed the paint.)

Eventually I got the base color restored - that is, the green color was back with dark green recesses (**photo 9**). To emphasize the three-dimensional contours even more, I mixed a highlight color by adding white to the basic green. I also mixed in a bit of yellow to keep the lighter green from having a frosty look, which white alone might have given. Then I repeated the drybrush process, hitting only the areas I wanted to stand out in the sharpest relief (**photo 10**).

If I had overdone the highlights, I could've dulled them down by drybrushing with the base color, or even reapplying the dark wash. Frequently I have to seesaw between lighter and darker colors until I attain the effect I want. That's okay, because the complexity of all those colors adds to the realism of the paint job.

I treated the rest of Robin's costume using wash and drybrush techniques, except for his cape and boots. The cape we'll discuss shortly. The boots were left gloss green, to represent a tough, flexible material. The "automatic" effects of the wash and drybrush techniques made a big difference in Robin's appear-

ance, but I still had to do a lot of detail hand painting as well.

### Heavy Metallics

Metallic paints work a little differently than other colors. They generally look best if applied over a flat black base. You can also apply a black wash over a metallic base, then drybrush as above. Just by way of illustrating the different effects you can get, I painted the small electrical boxes flat black. Then they were drybrushed with Testors Gunmetal (a dark metallic gray), followed by highlighting with silver.

Silver, you'll recall, was sprayed on the control panel board. I applied the same flat black wash to it that I used on Robin's costume (it's often useful to mix a large batch of wash at one time, but not so much that you can't use it all in a day or so because the thinned paint deteriorates quickly). When dry, I drybrushed with more silver, then highlighted with aluminum, which was a lighter metallic color. A final coat of clear flat dulled the metallic appearance, leaving the control panel board and electronic boxes the shades of gray I wanted (**photo 11**). They still had a little metallic sparkle that contrasted nicely with the dull gray floor.

The same techniques I've mentioned here will work for other metallics like gold or copper, too.

### Holy Powder Puff!

Up till now, I'd been working on inanimate features of the kit. Robin's skin tones needed to be handled with a little more subtlety than hobby paints could provide. Therefore, I switched to a different material to color the flesh tones: chalk pastels.

These pastels are artists' materials that come in a variety of vivid colors. They can be expensive, but it isn't necessary to get the top-of-the-line chalks. If you hunt around at crafts stores that carry art supplies, you should be able to find a bargain. I found an off-brand set of twenty-four colors for twelve dollars that has lasted me for several years.



## • Robin...Continued from page 17 •

The painted surface on which the chalks are to be applied must have a flat finish. This provides the "tooth" - a slightly rough surface - which holds the chalks in place. So I sprayed Testors Dullcote over Robin's flesh, to cut the gloss of that almond base. A few light applications gave me the dull finish I needed.

These chalks are very easy to work with; you just scrape a piece over a piece of sandpaper, then apply the powder to the area you want with a dry paintbrush (photo 12). It's possible to mix custom shades, as I did for Robin, to create just the hue you want. If you make a mistake, the chalk can be washed off with soap and water.

Photo 13 shows the flesh tones completed on Robin's head. What was going on with his hairline, you ask? I eventually filled his hair in with paint, but once again hobby paints couldn't do a very good job of creating the subtle transition I wanted at the hairline. So I used the chalks to blend Robin's black hair into his skin. This created a much more lifelike appearance than simply painting a hard black line would have done.

While I had the chalks out, I also used them to color Robin's cape. The flat, smooth areas would have been difficult to color with wash and drybrush techniques. Plus the chalks usually work better over lighter colors. To "fix" the chalks to the paint surface, so the powder doesn't get rubbed off, requires a spray of a clear finish. The clear application can make light chalk colors fade or disappear altogether. This is another area where experience will be the best teacher, knowing how much to overcompensate the chalk to allow for the effect of the clear coat.

### A Sticky Situation

I hand brushed the details of the base elements (photo 14). (Notice that the "glassware" has been painted to match the portions of the model behind them. That's about the best way I know of to make a solid plastic part represent clear glass.) Now it was time to assemble the figure.

First I had to get the paint masking off, so back on went my rubber gloves. I used tweezers, the tip of my hobby knife and whatever else it took to get up all the masks. As I painted I was careful to remove the masks as soon as I thought it was safe to handle the model. This helped prevent the removal process from pulling up the paint. Where I used tape I pulled slowly, with the back of the tape parallel to the surface of the model (photo 15).

I used tube glue to assemble Robin because it was easy to

control and dried slowly, so I had time to adjust the assemblies as needed. First I glued the torso and legs assemblies together, since they were keyed for a specific fit. Taking my time, I cemented the feet to the legs assembly, adjusting the fit to the base elements that had been set in position (photo 16). Once the cement had set up I attached Robin's arms, referencing their fit to the position of the legs on the base and the grip of the hands on the control panel board switch. The head went on last.

### Clearly A Good Idea

When the figure's glue joints were completely dry, it was time to apply clear finishes. These sealed and protected the paint - particularly the fragile chalk colors - and created a realistic sheen on the various features of the model. To begin with I sprayed Dullcote over everything. Most areas of this kit required a flat finish.

The next application was Testor's Clear Satin finish. This I applied with a paintbrush to areas that I wanted to have a slight sheen: Robin's gloves and belt. The satin finish imparted a leathery look to these items.

For a higher gloss, I switched to Future Acrylic Floor Polish. This stuff is great - it doesn't react with hobby paints, is quite inexpensive and can be cleaned from paintbrushes with soap and water. It takes about half an hour to dry. The more coats you apply, the glossier the finish. You can also mix it with flat acrylics for a semi-gloss appearance.

I used a single application of Future on Robin's hair to give it a nice shine; more coats would have made it look oily. Future also went on the switches on the electronic apparatus to give them a metallic shine. I frothed it up with my paintbrush and applied it to the spilled chemical details to make them look wet.

For the highest gloss I used Testors Clear Top Coat, which I applied to the glassware. One or two coats gave them a truly glassy appearance. Two-part epoxy resin can be used for the same purpose, but it's much thicker and very tricky to use (photo 17).

Okay! We're coming down the home stretch on Robin, the Boy Wonder. The LAST installment of "Modeling Basics 101" is coming as we get to "The Big Finish".



# SHE MAY NEVER SAIL THE SEVEN SEAS BUT SHE MIGHT GET YOU FIFTEEN MINUTES OF FAME

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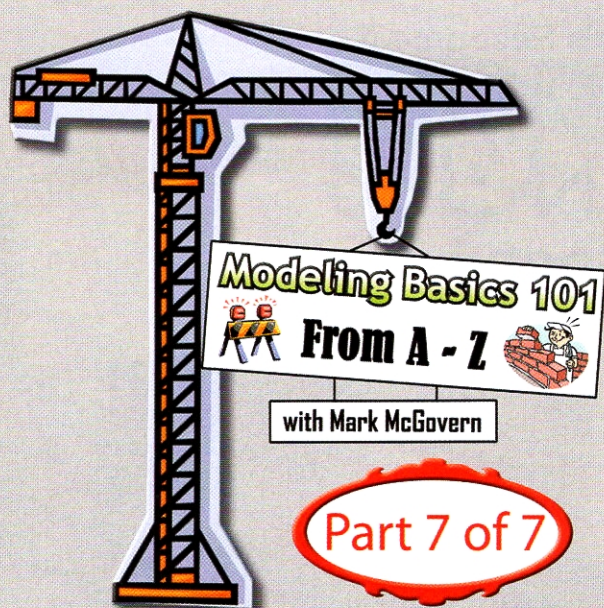
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SEE STORE FOR CONTEST DETAILS, PRIZES AND ENTRY GUIDELINES.



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### The Big Finish!

At the end of Part 6 we left the figure of Robin, the Boy Wonder and the individual base elements painted and assembled. All ready to finish up, eh? Not quite - before we glue everything together, we need to apply some decals.

### Fun Film Facts

We'll be discussing "waterslide" decals, as opposed to the "peel-and-stick" variety. The latter are made of paper or plastic and are designed for younger modelers. These pressure-sensitive decals are usually too thick to create a believable appearance on a model. Waterslide decals are much thinner.

Decals are images that have been printed onto a transparent, adhesive-backed carrier film, which in turn was coated onto a piece of backing paper. When the backing paper is moistened with water, the carrier film's adhesive activates. Once the adhesive has softened enough, the carrier film and the printed image can be slid off the paper and onto the surface of the model. If the decal has been applied properly it will look as though it had been painted on the model.

For Robin, I used decals to create the various instruments on the Control Panel Board (photo 1). The same procedures I used for applying these decals would hold for any others.

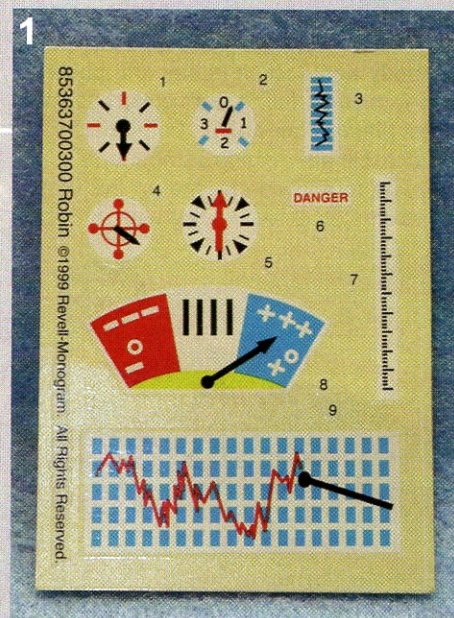
All decals have the requirement that they be applied to a clean, glossy surface. A finish looks flat because it's rough, with microscopic peaks and valleys in the surface of the paint. These diffuse reflected light and thus create the dull appearance. Any decal applied to a flat finish will only be resting on the tops of those peaks. This will cause "silvering" - a whitish appearance under the decal - which is the result of light being reflected through the decal film from the valleys beneath. But with a glossy finish, the decal film contacts the entire surface and there will be no silvering.

Once the decals have dried, they can be overcoated with a clear finish, which will seal and protect them. The finish of the clear coat - flat, satin, or gloss - will also help to integrate the decals with the surrounding paint.

### Dial D For Decals

Most of the time, decals are pretty translucent; the image that looked bright on the backing paper may become much darker when applied over a dark surface. To keep the image looking bright, often it is necessary to provide a light background over which the decal is to be applied.

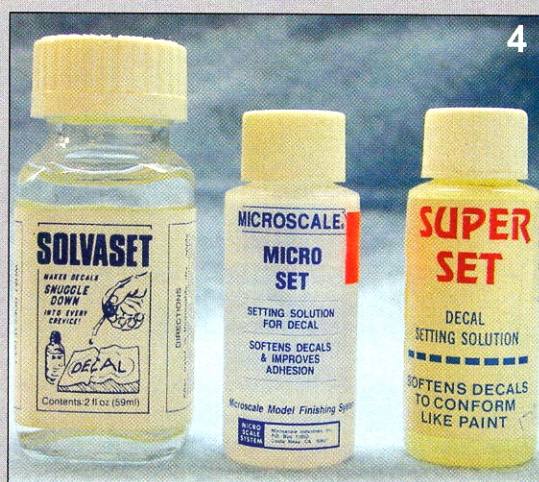
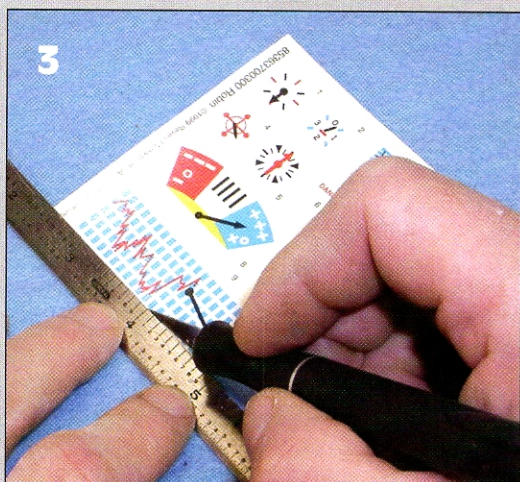
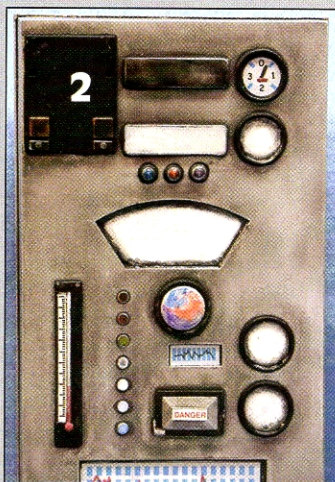
Knowing this, I took steps to prepare the areas of the Control Panel Board that would receive the decals. First, I removed some of the dark paint that had gotten



Top photo: Robin done at last!

Photo 1: Here are the kit decals - nice, but...





**Photo 2: White backgrounds ready for the decals. Photo 3: Go easy when cutting the decal off the sheet. Photo 4: A selection of decal solvents and setting solutions.**

onto the instrument faces where the decals were to go by swabbing these areas with a brush dipped in some thinner. This left the white plastic exposed in the center of each area, providing the light background I wanted for the decals. (I took advantage of the white plastic, but a white background on a dark-painted surface can be achieved in other ways. The area where the decals will go could be undercoated with white paint, or a piece of plain white decal film which has been cut to the same shape as the overlying decal could be applied to the appropriate area.)

You'll notice that the instruments weren't completely cleaned off - I left some black paint around the edges (**photo 2**). The black dulled the decals' brightness around the edges, to suggest that the instruments were "illuminated." Also, as the decals didn't fit their locations on the plastic part precisely, the black paint helped camouflage the black-edged decals. That made them look like they fit better than they really did!

Next, each of the areas where the decals were to go were given a coat of Future Acrylic Floor Polish to impart the gloss surface I would need for the best adhesion of the decal film. For this model I could brush the Future inside the raised rims of the instruments, but with a large, flat surface - such as a spaceship's hull - the Future should be applied over the entire model. Otherwise, the un-Futured areas might show through the finish clear coats. The Future needs to be allowed to cure

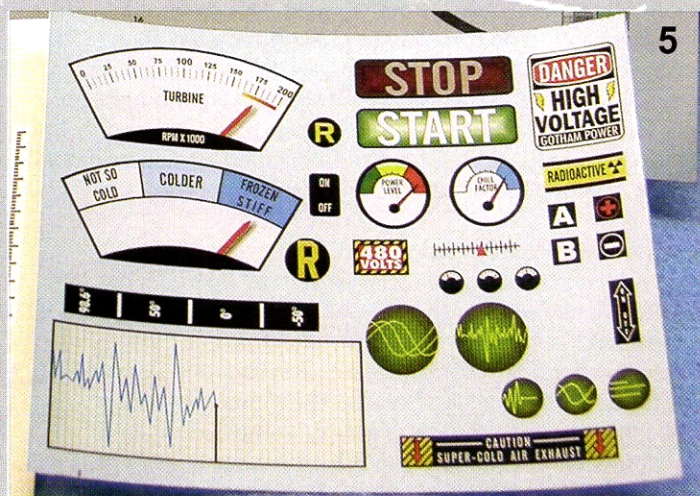
thoroughly - eight hours or so - before the decals are applied.

### Cut and Paste

The application of decals began with my carefully cutting the area of the backing paper away that contained the decal I wanted to use. Some decals are printed over a solid layer of clear carrier film; with others, only a little of this film extends beyond the printed image and over the backing paper. Either way, it's best to remove the carrier film by carefully trimming around the boundaries of the color image with a new hobby knife blade. I didn't have to cut through the backing paper - it was enough just to lightly score around the image (**photo 3**).

To activate the decal's adhesive, I dipped it in warm water contained in a yogurt cup (as I've mentioned earlier in this series, these cups are handy for a multitude of tasks). Holding the decal with a pair of tweezers, I immersed it into the water for a few seconds - only long enough for the backing paper to

**Photo 5: ...The JTGraphics replacement decals are better! Photo 6: Robin, assembled out-of-the-box.**







**Photo 7: A lineup of paint removing materials. Photo 8: Don't try taking a bath in Pine Sol at home, kids!**

be thoroughly soaked. Then I removed the decal and let it sit on a paper towel. It took thirty seconds or more for the decal to come free from the backing paper. I didn't try to force it to come off, which would have risked tearing the decal.

When the decal slid easily on the paper I picked the backing paper up with my tweezers, held it over the spot on the model where the decal was to go, then slid it off the paper with a moistened paintbrush. I resisted the urge to try moving the decal around with my fingers, as I have learned from painful experience that the decal would stick to me far better than the plastic. Why they do that, I don't know...they just do.

The moist brush helped get the decal in its final position with a little prodding and poking; I did as little of that as I could. Then I squeezed out any air bubbles trapped beneath the decal with a moist paper towel. Once the decals were all in place I allowed them to dry thoroughly before handling the model again.

### Settle Down!

The surfaces on which I applied Robin's decals were all quite flat. But sometimes it's necessary to apply decals to a more textured surface, such as one with raised rivets. Even the relatively thin film of the decal won't be able to conform to such features. It will "tent" over them, and look like a decal instead of a painted marking.

A decal solvent is needed to deal with this situation; Solvaset is one such material. As its name implies, this liquid actually dissolves the decal film and softens it so that the decal conforms to the raised details. The result is a marking that looks like it had been painted onto the surface.

A word of warning - there are many of these decal solvents, and many different brands of decals. The compatibility of the solvent with the model's decals should be tested if there is any uncertainty. Apply the solvent to a decal that won't be used or on a registration mark on the sheet - anything other than a major marking that the solution could potentially ruin.

The same goes for decal setting solutions. Unlike the solvents, these liquids improve the adhesion of the decals to the model surface. Setting solutions are not the same as solvents, so read the labels of these materials before you buy them. Most hobby stores carry these items (**photo 4**). I used a setting solution to help get Robin's chest insignia to stick.

### To Kit Decal Or Not To Kit Decal

"Huh? What chest insignia?" you may ask, because the kit decals don't include that item. Well, back in Part 4 of this series, I showed how it was possible to reduce the decal sheet that came with the kit in order to use the large dial decals for the Control Panel Board to jazz up the small dials on the Electronic Boxes. The plan was to cut out the reduced artwork and glue the paper dials onto the boxes; I intended to create

more depth than the cartoony kit images. I was happy to use the JT Graphics decals rather than pasting reduced paper images onto the model. One of the great developments in our hobby has been the rise of these "aftermarket" manufacturers, who provide parts and decals that can improve a model with little effort and low cost.

Once the decals had all dried I removed any stray traces of adhesive or setting solutions with a moist cotton swab (sometimes this requires rubbing alcohol rather than water, but take care that the alcohol doesn't react with the decals or adjoining paint). I brushed more gloss finish over the decals, to seal them and suggest that the instrument faces were under glass.

### Can This Be The End For The Boy Wonder?

Final assembly was pretty straightforward, thanks to the well-defined locators sculpted into the base. Because of them I could use good old tube glue, which provided all the strength I needed. The slower-setting tube glue also gave me extra time to adjust the position of Robin's feet on the Electrical Boxes and the ends of the switch in his hands to the Control Panel Board. At last the model was done (**photo 6**)! Well, pretty much...

### If At First You Don't Succeed...

Webster's Dictionary defines plastic as "capable of being molded." To me, that means a model can be worked and reworked until it comes out just as the builder wants. Although I've tried to demonstrate the best ways to build styrene models in this series, I think I should also offer a few techniques for remedying things when they go wrong.

I wasn't completely happy with my paint job on Robin; I felt his shirt didn't come out as well as it might have. The wash I applied to the vest and sleeves areas was way too dark, and it didn't help that I've had trouble using Testors enamels for dry-brushing light reds over darker ones in the past. Plus I learned too late that I was using "Insignia White," which is a semigloss paint, instead of flat white when I was mixing the highlight colors for the shirt. That made the drybrushing I did on the whole shirt look pretty harsh. Therefore I decided to disassemble the figure, remove the unsatisfactory paint, and begin anew.

### Off With His Head, etc.!

Knowing that I would be taking the figure apart after I'd photographed the "finished" model, I deliberately kept the tube glue I applied to Robin at a minimum. That made it easy to gently pop the various assemblies apart. This can often be done with a built-up kit, which is sometimes the only form in which a collector can acquire a rare, out-of-production model.

With some build-ups you will encounter heavier glue joints (particularly, as it always seems, in places where there's a lot



of important detail you don't want to lose). Then it may be necessary to weaken the joint by cutting into it with a hobby knife, making the glue brittle by placing the model in the refrigerator for a few hours, or applying a solvent such as lacquer thinner to the problem area. Each specific problem will require a different solution - but caution and patience will always be necessary to get those assemblies apart. Still, you may end up having to accept the assemblies as they are and work around them, or be willing to repair some damage to the model if you can't coax the joints apart any other way.

### Bath Time For Robin

Many materials will remove hobby paint. Some common removers are Pine Sol or similar household cleaner concentrates (but not the citrus formulations, which may attack a kit's plastic, as fellow modeler Charlie Smith has warned me), Castrol Super Clean Cleaner - Degreaser, Easy-Off Fume Free Oven Cleaner and Poly S E-Z Lift Off (**photo 7**).

I have listed these removers in increasing order of harshness with regard to their effect on the model itself. For example, I have found that prolonged exposure to the Poly S product can actually damage thin plastic. Remember, too, that these materials can dissolve model paints, so think what they can do to you! The seemingly innocuous household cleaners are concentrates after all, and can damage your skin. It's always a good idea to protect yourself with rubber gloves, a respirator and goggles when handling these materials.

The procedure for removing paint from a model part or assembly is pretty much the same for most of the materials listed above. A plastic bag or covered container like a Tupperware bowl is used to keep the remover from drying out as it loosens the model paint. The remover is sprayed or brushed onto the model, and then the container is sealed. When using the liquid detergents or Castrol cleaner, the model can be submerged in the fluid, which, by the way, is reusable (**photo 8**).

Let a few hours pass for the agent to do its work; you can test the progress by scraping with a brush handle to see whether the paint has softened. The shorter the amount of time the remover is on the model the better. Otherwise you might find that the remover has attacked a delicate glue joint. Removers may also take off any putty work you did along with the paint. In that case you'll have no recourse but to reapply the putty, let it harden and sand it as you did the first time around.

When the paint is sufficiently loose it can be removed by scrubbing under running water with an old toothbrush. Stubborn spots may require a second application of remover if the area is very detailed. If the paint is sticking to a flat area it can simply be sanded off. Take care that the loosened paint doesn't clog your drains.

### Mr. Murphy Attacks!

In plastic modeling as in life, if something can go wrong, it often will. I repainted Robin's arms and torso to my satisfaction. But when I tried to reattach Robin's arms to his body, I discovered that I had some major gaps; you could actually see light coming through them. I didn't want to have to putty the gaps,



**Photo 9: White glue to the rescue! Photo 10: The filled and painted joints.**

sand the putty, repaint the damaged finish, etc. So, given that the gaps fell where seams would naturally occur at the joins of Robin's sleeves to his vest, I tried something else.

I applied several layers of white glue to the problem areas (**photo 9**). Before the glue could dry, I smoothed its edges using a brush moistened with water. That way, a ridge of dried glue wouldn't form and spoil the smooth appearance of the adjoining areas. Once the gaps were filled, I painted them with acrylic flat black model paint, which I knew wouldn't affect the underlying glue or surrounding oil-based finish. This allowed me to fade the edges of the black paint with water for a natural appearance. After a little touch-up drybrushing with red and green, the gaps were pretty well hidden (**photo 10**).

Another problem arose with the nameplate: I sprayed too much flat sealer on it. The clear coat - Krylon's - actually attacked the plastic, imparting a "crackle" effect (which, for some applications, might not be a bad thing). I stripped the paint off the part and got to work.

I lightly sanded the nameplate frame and the letters that spell out "ROBIN" to smooth them; I decided to just live with the crackled texture on the background. The molding of the lettering was a little shallow to begin with and much more so after the sanding. I used Aves epoxy putty to raise the level of the lettering (**photo 11**). After the putty had set and been sanded a bit I was able to repaint the nameplate.

### "To The Batshelf, Robin!"

Robin was built out of the box for the purpose of illustrating the series, but afterward I made some alterations to the finished base. I couldn't see how any scientist, no matter how criminal or deranged, could leave laboratory equipment laying around for masked crimefighters to step on. So I scratchbuilt a table from styrene sheet and angle stock to support the large Electrical Box. The smaller one, with a styrene bottom and power cord added to it, stayed on the floor, albeit at a precarious angle.

The removal of the Electronic Box locators and other items from the kit floor left it pretty well chewed up. I also enlarged the floor part with a piece of foamcore board. The surgery was covered with a piece of sheet plastic (**photo 12**). A new support for Robin's left foot was made from a dishwashing detergent bottle cap with styrene, Styrofoam and metal details added. Clear lenses, taken from various sizes of "squiggle eyes" for dolls, were cemented over the dials to represent glass covers. The completed model was epoxied to a stained and clear-coated wooden craft plaque (**photo 13**).



• **Robin...Continued from page 55 •**

These changes really go beyond the basic techniques that this series was meant to illustrate (photo 14). But I mention them to emphasize the fact that you can build your model any way you want. That you can express yourself through your unique rendition of a mass-produced model kit, I truly believe, is one of the aspects of our hobby that elevates it to the level of Art.



**Photo 11:** Aves restores nameplate lettering. **Photo 12:** Plastic surgery for the kit floor.

**Yeah, But What If -?**

There is much more to the process of styrene model kit building than I've been able to relate in this series.

I'd like to thank Fred DeRuvo for allowing me to share with you the fun and fulfillment I've gotten from over forty years of plastic modeling. I hope that "Modeling Basics 101" - and Modeler's Resource as a whole - will help you to enjoy the hobby as much as I have.

JT Graphics replacement decals for Robin, the Boy Wonder (Revell-Monogram kit #85-3637): The decals are available for \$10.00 (shipping is free if inside USA or Canada). Make your check or Money Order payable to **Jeffrey Wacławski, 157 Hampshire Road, Baltimore, MD 21221 USA.**



**Photo 13:** Scratchbuilt add-ons improve the base, and another angle of the finished Robin kit!